TECHNICAL MANUAL

AIR FORCE METROLOGY AND CALIBRATION PROGRAM

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SECTION 1

INTRODUCTION

1.1 PURPOSE. This Technical Order (T.O.) holds the methods and procedures for the management of the Air Force Metrology and Calibration (AFMETCAL) Program. That program is established and directed by AFI 21-113.

1.2 GENERAL. The AFMETCAL Program is an Air Force program that provides measurement standards and equipment, professional and technical metrologists, performing work centers (PWCs), a system of worldwide PMEL facilities, measurement equipment users, calibration data, and integrated planning. This program ensures the reliability and accuracy of systems, subsystems, and equipment. The program provides for the calibration and repair of Test, Measurement, and Diagnostic Equipment (TMDE). It also ensures measurement traceability of the TMDE through the Air Force Primary Standards Laboratory (AFPSL) to National Institute of Standards and Technology (NIST) or other AFMETCAL DET 1 approved sources. To accomplish this traceability, the AFMETCAL program requires that Air Force users and Precision Measurement Equipment Laboratories (PMELs) obtain calibration service from Air Force PMELs or the AFPSL as appropriate. AFMETCAL Det 1 must approve obtaining calibration service from other sources. The responsibilities of organizations in the AFMETCAL Program are identified in AFI 21-113.

1.2.1 AFMETCAL Detachment 1 AFMETCAL Det 1/MLEE has the responsibility to assign calibration and repair responsibility determinations for TMDE. The responsibility determinations are spelled out in T.O. 33K-1-100-CD-1 (T.O. 33K-1-100-1 and T.O. 33K-1-100-2), T.O. 33K-1-100-2MT-0, and weapon system Calibration and Measurement Summary (CMS) T.O.s.

1.2.2 Air Force Primary Standards Laboratory (AFPSL) Division. The Air Force Primary Standards Laboratory (AFPSL) is responsible for maintaining the US Air Force primary measurement standards. The standards are traceable to NIST or other sources as approved by AFMETCAL Detachment 1. These Air Force primary measurement standards are used to ensure the accuracy and traceability of the base measurement standards. The base measurement standards are provided to the PMELs.

1.2.3 Precision Measurement Equipment Laboratories (PMELs). PMELs are established at selected installations. The PMEL is the base-level AFMETCAL Program focal point. It is the activity authorized to possess and use Air Force base measurement standards. Operational details of the program are set forth in Section 3 of this T.O. and related command directives.

1.2.4 Program Controls. Commanders of the United States Air Force, Air Force Reserves and Air National Guard activities shall establish controls to ensure that TMDE, under their control, is repaired, calibrated, and certified. Commanders shall ensure that PMEL facilities are built according to AFMAN 32-1094 and operated according to Section 8 of this T.O. AFI 21-113, along with this T.O., applicable CMS T.O.s, T.O. 33K-1-100-1 and T.O. 33K-1-100-2/-2MT-0, and command directives prescribe those controls. All TMDE in use shall be calibrated at regularly scheduled intervals called out in CMS T.O.s and T.O. 33K-1-100-2/-2MT-0. Authorized exceptions to calibration are identified in Section 3 of this T.O., any applicable CMSs, and T.O. 33K-1-100-2/-2MT-0.

1.2.5 Other DoD Services Calibration Laboratories. The use of other DoD services calibration laboratories is only authorized when approved by the applicable MAJCOM FAM and AFMETCAL Det 1. The Army, Navy, and Marines all operate calibration laboratories using similar measurement techniques and management concepts, which provide measurement traceability to NIST. This policy does not extend to other government calibration laboratories. Units requesting support from another service shall follow the guidance in Section 4 which describes how to establish support agreements in addition to the guidance contained in the interservice support agreement regulations.

1.3 SCOPE. This T.O. applies to all activities that possess, use, calibrate, certify, and maintain TMDE.

1.4 DEFINITIONS. The following definitions shall apply for the purpose of this T.O.

1.4.1 ANSI/NCSL Z540-1-1994. The American National Standards Institute published, "Calibration Laboratories and Measuring and Test Equipment - General Requirements ".

1.4.2 Calibration. Calibration is a comparison between items of equipment, one of which is a measurement standard of known accuracy, to detect, correlate, adjust and report any variation in the accuracy of the other item(s).

1.4.3 Calibration, Limited. Calibration of TMDE to less than the accuracy or functional capabilities specified in the authorized calibration procedure or data.

1.4.4 Calibration, Special. Calibration of TMDE to all specifications called for in the authorized calibration procedure plus additional requirements.

1.4.5 Calibration and Measurement Requirement Summary (CMRS). This is a three category, in-line, summary of measurement parameters. Normally, a Department of Defense (DoD) system contractor prepares the CMRS. A CMRS identifies all measurement requirements within a specific system or item of equipment. The CMRS further displays the proposed solutions for maintaining the system measurement requirements within the stated limits. It is also used to identify the need for new calibration standards. This data is provided to AFMETCAL Det 1, 813 Irving-Wick Dr W, Ste 4 M, Heath OH, 43056-6116. AFMETCAL Det 1 uses it for ensuring calibration supportability and planning for PMEL support for a particular weapon system/subsystem. AFMETCAL Det 1 maintains the CMRS.

1.4.6 Calibration and Measurement Summary (CMS). A T.O. which identifies calibration support necessary to ensure the operational readiness of a specific weapon system or subsystem. The summary describes the calibration concept and is calibration authority for the applicable weapon system or subsystem. The CMS is printed as a weapon system or 33K series technical order. AFMETCAL Det 1 maintains all Air Force CMSs.

1.4.7 Calibration Certificate or Calibration Report. Also referred to as, "Report of Measurement". It is a document containing data relevant to the calibration of a specific test instrument or standard. The AFMETCAL Program does not differentiate between a calibration certificate and a calibration report provided the document contains the required information to interpret the calibration results for the specific calibration.

1.4.8 Calibration Chart. A chart prepared for a specific item. It shows the difference between the nominal value and the actual value of a measurement or group of measurements.

1.4.9 Certification. The documented designation that standards and TMDE have been calibrated and meet established technical requirements. It can also mean that a calibration laboratory (PMEL or AFPSL) has successfully fulfilled the AFMETCAL assessment criteria of this T.O.

1.4.10 Correction Chart. A chart prepared for a specific item, which shows corrections that must be applied to indicated values to obtain true values.

1.4.11 Equipment Types:

a. Mission Equipment. Part of operational ground or airborne systems.

b. Support Equipment (SE). A broad category of equipment and tools used to verify and maintain mission equipment. Support equipment can include equipment used to verify the operation of other support equipment. SE is categorized as either TMDE or Non-TMDE. The AFMETCAL Program is primarily concerned with the support equipment cateqorized as TMDE.

c. Test, Measurement, and Diagnostic Equipment (TMDE). Those devices used to maintain, evaluate, measure, calibrate, test, inspect, diagnose, or otherwise examine materials, supplies, equipment, and systems to identify or isolate actual or potential malfunction, or decide if they meet operational specifications established in technical documents. ANSI/NCSL Z540-1-1994 refers to this equipment as “measuring and testing equipment.”

d. Precision Measurement Equipment (PME). For purposes of this T.O., PME is the same as TMDE. This is the former title for TMDE.

1.4.12 Measurement or Reference Standard. Equipment that serves as the basic means by which the accuracy and traceability of a precision measurement is derived. The typical chain of measurement standards is shown in Figure 1-1.

1.4.12.1 Absolute Measurement Standard. Designated measurement standards based on the absolute value of natural physical constants whose values can be accurately repeated under controlled conditions. Examples are LASER Length Standards, Josephson Junction Voltage Standards, and Hall Effect Magnetic Field Standards.

1.4.12.2 Air Force Base Measurement Standards. Equipment certified by the AFPSL or AFMETCAL Det 1 approved sources for use by an Air Force PMEL as a measurement reference.

1.4.12.3 Air Force Measurement Standards. Equipment certified by NIST or other AFMETCAL Det 1 approved sources and used by the AFPSL as a basic measurement reference for the Air Force.

1.4.12.4 National Measurement Standards. Equipment or physical constants identified and normally used by the NIST to serve as a basic measurement reference for use throughout the United States and at U.S. installations/activities overseas.

1.4.12.5 Working Standards. TMDE certified by PMEL and used to calibrate other TMDE.

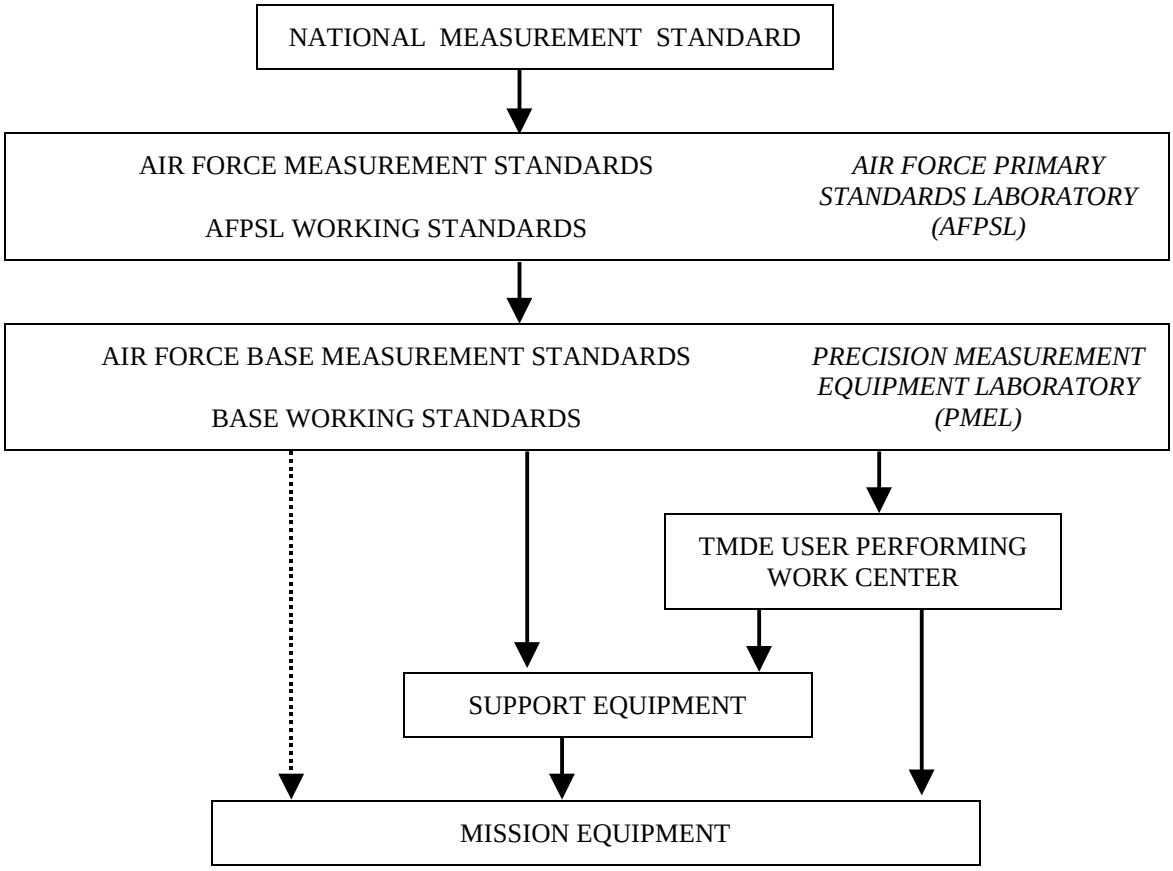

Figure 1-1
MEASUREMENT TRACEABILITY OF THE AIR FORCE
METROLOGY AND CALIBRATION PROGRAM

1.4.13 Metrology. The science or system of weights and measures used to determine conformance to technical requirements including the development of standards and systems for absolute and relative measurements.

1.4.14 PMEL Manager. Synonymous with PMEL superintendent, PMEL branch chief, TMDE branch chief, TMDE flight chief, TMDE section chief and Laboratory Manager. This is the individual responsible for day-to-day management and operation of the PMEL and its associated workcenters, such as production control, total quality program and material control.

1.4.15 PMEL Quality Assurance (PQA). Highly qualified, 7-skill level or equivalent when possible, PMEL personnel assigned to the PMEL. Selected by PMEL management and appointed in writing. PQAs are the only personnel designated to perform Quality Reviews, Process Reviews, and Standard Reviews applicable to the Quality Program outlined in this T.O.

1.4.16 Shall. Shall is a directive statement. Reference T. O. 00-5-1.

1.4.17 Traceability. The ability to relate individual measurement results to national standards or nationally accepted measurement systems through an unbroken chain of comparisons all having stated uncertainties. Mandatory USAF traceability is accomplished as shown in Figure 1-1 or as approved by AFMETCAL Det 1.

1.4.18 PMEL Mobile and On-Site Measurement Capabilities:

1.4.18.1 Electrical Standards Set (ESS). Transportable calibration equipment. It consists of Working Standards and TMDE and suitable carrying cases selected for their ability to function within prescribed performance and environmental tolerances. They support a selected weapon system in both fixed and deployed situations.

1.4.18.2 Field Assistance Support Team for Calibration (FASTCAL). A portable PMEL designed for rapid deployment to support emergency calibration needs. It consists of a set of 12 environmentally controlled shelters containing measurement standards and other TMDE. The shelters are joined together when in use, but they can be taken apart and airlifted to any location as needed.

1.4.18.3 ISO Standard 17025. The international standard for commercial metrology, "General Requirements for the Competence of Calibration and Testing Laboratories" which includes the relevant requirements of ISO 9000 series standards.

1.4.18.4 Jet Engine Test Stand Calibrator (JETSC). TMDE and accessories needed to perform on-site calibration of jet engine test stands. They are housed in a trailer or ruggedized cases, which has both a work and a storage area.

1.4.18.5 Portable Automatic Test Equipment Calibrator (PATEC). The PATEC is used to calibrate Automatic Test Equipment (ATE) on site. The PATEC consists of a set of portable standards. The portable standards are IEEE-488 compatible wherever possible. A Core PATEC is designed to meet the calibration needs of a variety of test stations.

1.4.18.6 Transportable Field Calibration Unit (TFCU). Working standards in carrying cases selected for their ability to function within given performance tolerances without benefit of a controlled PMEL environment. The TFCU is used to calibrate TMDE located at remote sites or bases.

1.4.19 Air Force Primary Standards Laboratory (AFPSL). The highest level standards laboratory in the AFMETCAL Program. It maintains Air Force measurement standards certified by the NIST, the US Naval Observatory (USNO), or other AFMETCAL Det 1 recognized standards.

1.4.20 Precision Measurement Equipment Laboratory (PMEL). A Laboratory authorized to own and use base measurement standards to maintain working standards. The working standards are used along with PMEL-owned TMDE to maintain (troubleshoot, align, repair, and calibrate) TMDE designated as PMEL responsibility. Authorizations for PMEL equipment and facility requirements are tailored to meet specific requirements for supported missions. PMELs are the base-level link for measurement transfer and maintenance self-sufficiency for all systems in the Air Force. The following are the types of PMELs:

a. Type IIA. A base level PMEL with a 68°F room providing support to an Air Logistics Center (ALC) and/or a large geographical area. These laboratories are operated at each ALC by AFMC. PACAF and USAFE theater support commands operate others located at Kadena AB JA, Elmendorf AFB AK, and Feltwell (RAF) UK.

b. Type IIB. A base-level PMEL which can support aircraft, missiles, ground systems, and/or other equipment on base or in the local area. This includes the Field Assistance Support Team for Calibration (FASTCAL) sets. Due to its mission, the FASTCAL can be co-located with a Type II () PMEL.

c. Type IIC. A base level PMEL with a 68°F room typically providing support to research, development, test or evaluation programs, as well as other operational and support functions.

d. Type III. A PMEL tailored to satisfy a specific mission and normally receiving calibration support from a Type II () PMEL. A Type III PMEL is not authorized at an installation where a Type II PMEL exists. This includes the PMEL on the US Naval ship, Observation Island.

e. Type IV. A PMEL established to support a specific weapon system. It uses a transportable measurement system in both fixed and deployed locations. A Type IV PMEL receives calibration support from a Type II () PMEL. It may be located at an installation where a Type II () PMEL exists.

1.4.21 Commercial Calibration. Calibration of TMDE obtained from a commercial source. This is to be considered as a last option only after organic support options have been considered. AFMETCAL Det 1 approval is required prior to obtaining calibration from a commercial source.

1.4.22 Contract Calibration. Commercial calibration contracted and funded by AFMETCAL Det 1. Part numbers requiring this service are identified as Note 49 (N49) Note 59 (N59) and Note 64 (N64) for calibration support responsibility. This service will be considered for PMEL measurement standards limited for use by direction of calibration technical order on a case by case basis.

1.4.23 Program Acronyms:

a.	AEF	Air Expeditionary Force
b.	CBU	Calibrate Before Use
c.	CFR	Code of Federal Regulations
d.	CMAL	Controlled Multiple Address Letter
e.	CPIN	Computer Program Identification Number
f.	ECS	Environmental Control System
g.	EME	Equipment Management Element
h.	ESD	Electrostatic Discharge
i.	FMS	Foreign Military Sales
j.	GEOLOC	Geographic Location
k.	HIR	High Intensity RADIAC
l.	ICO	Initial Calibration Only
m.	ISA	Interservice Support Agreement
n.	JDD	Job Data Description
o.	JETSC	Jet Engine Test Stand Calibrator
p.	MAP	Measurement Assurance Program
q.	MCA	Measurement Capability Assessment
r.	MDC	Maintenance Data Collection
s.	MOB	Mobility
t.	NC	Nonconformity
u.	NCR	No Calibration Required
v.	NEC	No End Item Calibration
w.	NHA	Next Higher Assembly
x.	NPC	No Periodic Calibration
y.	NRC	Nuclear Regulatory Commission
z.	OEM	Original Equipment Manufacturer
aa.	OWC	Owning Work Center
bb.	PAMS	PMEL Automated Management System
cc.	PNC	Process Nonconformity
dd.	PT	Proficiency Testing

ee.	PQA	PMEL Quality Assurance
ff.	PR	Process Review
gg.	PTRS	Precise Time and Reference Station
hh.	PWC	Performing Work Center
ii.	QDR	Quality Deficiency Report
jj.	QNC	Quality Nonconformity
kk.	QP	Quality Program
ll.	QR	Quality Review
mm.	RC	Root Cause
nn.	SA	Security Assistance
oo.	SATAF	Site Activation Task Force
pp.	SBSS	Standard Base Supply System
qq.	SICL	See Individual Component Listing
rr.	SICW	See Item Calibrated With
ss.	SR	Standard Review
tt.	TAR	Test Accuracy Ratio
uu.	TCM	Technical Content Manager
vv.	TI	Test Instrument
ww.	TRC	Technical Repair Center
xx.	WRM	War Reserve Material
yy.	WUC	Work Unit Code

SECTION 2

AFMETCAL PROGRAM ORGANIZATION AND INTERFACE

2.1 GENERAL. The AFMETCAL Program includes the AFMETCAL Det 1, the PMELs and their resources, and the TMDE in the Air Force. The directives that provide the policy and guidance are also part of the program. The purpose of the AFMETCAL Program is to ensure that all Air Force TMDE used to make measurements is accurate, reliable, provides standardized measurements, and is traceable through the AFPSL to NIST or other AFMETCAL Det 1 approved sources. This TMDE is used to make sure that each system and subsystem is accurate and reliable and ensures that they properly interface with other systems.

2.2 AFMETCAL PROGRAM.

2.2.1 Figure 2-1 Description. Figure 2-1 depicts each element of the AFMETCAL Program and the interrelationship of major Air Force organizations. The center circle identifies the major elements of the AFMETCAL Program: AFMETCAL Det 1, the PMELs, and TMDE user/owners. The focus of the AFMETCAL Program is to ensure accuracy and traceability of TMDE. This TMDE is used to ensure the accuracy and reliability of all Air Force systems. The resources needed to operate the AFMETCAL Program are identified in the rectangle. In cooperation with the other elements, AFMETCAL Det 1 provides program guidance, PMEL standards, traceability of standards, calibration procedures, PMEL evaluations, metrology engineering support, and determines calibration requirements of systems. The PMELs are the performing work centers containing the personnel that calibrate, certify, and repair the TMDE owned and used by Air Force organizations. The AFMETCAL program requires user/owners and PMELs to obtain calibration service from Air Force PMELs or the AFPSL as appropriate. AFMETCAL Det 1 must approve obtaining calibration service from other sources. The owners of TMDE utilize their PMEL calibrated items to verify their support equipment (test benches, simulators, etc.) as well as major systems or subsystems. Owners of the TMDE are assigned owning work center (OWC) codes.

2.2.2 Resources used by AFMETCAL Program. There are four primary groups of resources used by the AFMETCAL Program to do its mission (personnel, equipment/material, documentation, and facilities). A basic need is sufficient personnel, having the necessary education, training, technical knowledge and experience for their assigned functions. These personnel require directives/procedures, material, and facilities. Calibration procedures provide the calibration methods. The PMEL requires parts and material to perform calibration and repair of TMDE. They also need their own measurement standards. The PMEL facility has some special requirements based on the system(s) it supports. The requirements of the program are based upon the measurement needs, and the accuracy of the measurements required of all systems supported by the Air Force. The outer ring of Figure 2-1 identifies the organizations that interface with the AFMETCAL Program. They provide, or coordinate, in the provisioning of the resources for the program. The outer ring of Figure 2-1 also shows the planning required to ensure that the proper AFMETCAL Program support is available. That support is needed for all systems from the time a system is under development through its entire life cycle.

2.2.3 Funding. Material and personnel needs are satisfied according to the amount of funding available.

2.2.3.1 Funds for daily operating expenses of the PMELs are provided by the owning command. They generally come from operation and maintenance (O&M) appropriations. Business operating funds are furnished for AFMC depot supported workloads. Air Force regional workload support is generally funded by O & M appropriations.

2.2.3.2 Centrally procured investment (equipment) item funding is provided through AFMC.

2.2.3.3 Centrally procured expense (parts) item funding comes from the USAF Stock Fund.

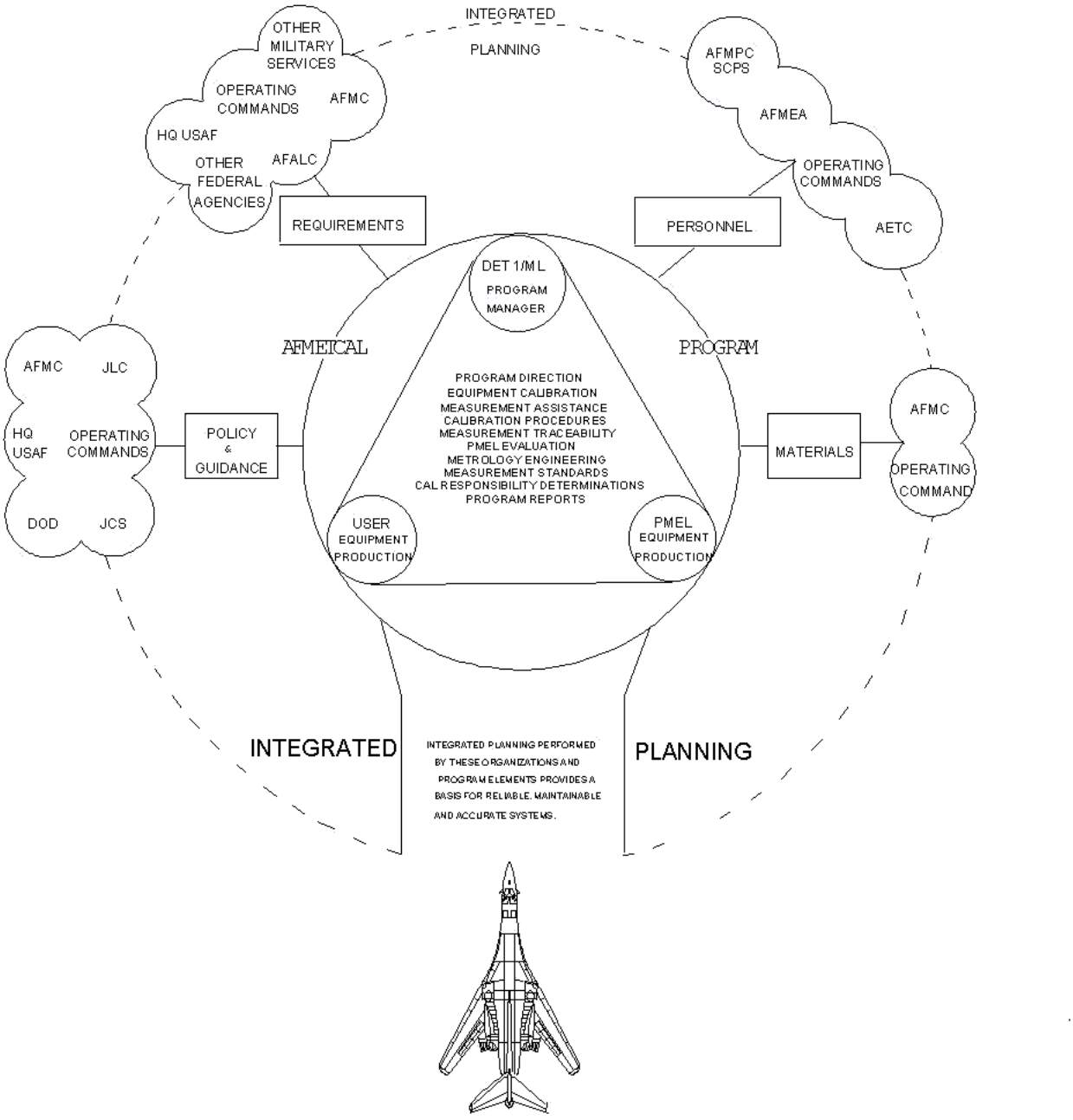

Figure 2-1
AFMETCAL PROGRAM RESOURCES AND PLANNING INTERFACES

2.2.3.4 Operating command or base procured investment and expense items are generally funded from (O&M) and equipment funds.

2.2.3.5 Facility funds are part of 3300 (Military Construction – Air Force) appropriations. This includes major and some minor construction projects as well as facility project planning efforts.

2.2.3.6 AFMC is responsible for funding research and development projects. This includes support required for those projects turned over to other operating commands.

2.3 <u>PROGRAM POLICY AND DIRECTION</u>. HQ USAF/ILMM provides program policy in AFI 21-113, Air Force Metrology and Calibration Program.

2.3.1 Requirements for TMDE Support from PMELs. PMELs and TMDE user organizations shall periodically review and update war plans related to their operations. The review shall consider where, who, what, and how TMDE shall be supported. Of special concern shall be TMDE that is mission essential to systems and subsystems required to meet Designed Operational Capability (DOC). This is necessary for mission capability and unit combat readiness reporting under AFI 10-201.

2.3.2 Periodic Reports Utilized. AFMETCAL Det 1 and the PMEL functional area managers utilize periodic reports (see PMEL Reports, Section 6) submitted by each of the PMELs to assist in managing the program.

2.4 PROGRAM REQUIREMENTS. New systems or improvements in weapon system performance are major factors in upgrading the measurement capability of supporting PMELs. AFMETCAL Det 1 has the responsibility to review the measurement requirements of all Air Force systems. This normally happens through the review of Support Equipment Recommendation Data (SERD) and/or CMRS documents.

2.4.1 Support Equipment Recommendation Data (SERD). The SERD review process is used to justify the weapon system support equipment. SERDs are reviewed by Operating Commands, the acquisition agency, the item manager, and AFMETCAL Det 1. Calibration responsibility determinations are made for approved SERDs. Calibration procedure requirements are established when necessary.

2.4.2 Calibration and Measurement Requirement Summary (CMRS). The CMRS documents are only required on complex systems. The completed document identifies the measurement requirements. They extend from the weapon system through the support equipment to the PMEL measurement standards.

2.4.3 Calibration and Measurement Summary (CMS). The CMS is published as a T.O. and details the measurement accuracy requirements on a complex system. AFMETCAL Det 1 is responsible for the technical adequacy of the CMRS and the subsequently published CMS. AFMETCAL Det 1 is also responsible for ensuring that measurement traceability exists from the national level to the system measurement. This includes the AFPSL capability. If the system has no unique or complex support requirements, the applicable support equipment is added to T.O. 33K-1-100-2/-2MT-0.

2.4.4 Measurement Upgrade Identification. Necessary improvements in PMEL measurement capability are identified early in the AFMETCAL Det 1 review. This is done in the calibration responsibility determinations and the calibration procedure preparation process. If additional measurement capabilities are required, the measurement standard shall be acquired and distributed by AFMETCAL Det 1 to the appropriate PMELs. If only national stock listed test equipment is required; the equipment shall be added to the applicable Allowance Source. The equipment shall be requisitioned by the PMEL. Normally, workload summaries derived from the SERD and CMRS reviews, are distributed to the operating commands. They are distributed at various times during the life cycle of the system to allow for PMEL support planning. Since two PMELs rarely support the same type systems, very few PMELs have the exact same measurement capability. Most have the same basic capability.

2.5 PROGRAM MATERIAL. Material is a broad category. It includes facilities as well as equipment, parts, and other items. It is used to support the AFMETCAL Program mission at all levels.

2.5.1 PMEL Establishment/Closing. Commands shall coordinate any change in the status of any PMEL with AFMETCAL Det 1 and receive final approval from HQ USAF/ILMM. This includes requirements for new PMELs, elimination of any existing PMEL, or a PMEL location change.

2.5.2 PMEL Facility Requirements Documentation. AFMETCAL Det 1 specifies PMEL facility requirements and performs reviews of facility project documentation. Design and construction are an owning command responsibility. AFMAN 32-1094-Criteria for Air Force Precision Measurement Equipment Laboratory Design and Construction and AFM 86-2, Standard Facility Requirements, are some of the major publications involved. T.O. 00-20-14 (PMEL Facility Operational Requirements, Section 8) contains facility-operating rules for PMELs.

2.5.3 Equipment. Equipment is obtained through the Air Force Equipment Management System (AFEMS) by Allowance Source authorizations from ALC Commodity Management, AFMETCAL Det 1, or local purchase.

2.5.4 Expense Items. Expense items (parts, tools, furnishings, etc) are obtained through the Standard Base Supply System (SBSS) from ALC Commodity Management, local purchase, or local manufacture.

2.5.5 Technical Data. Technical data is obtained from the Air Force T.O. System, AFMETCAL Det 1, other DoD Agencies, or local purchase.

2.6 PERSONNEL. PMELs shall have sufficient personnel, having the necessary education, training, technical knowledge and experience for their assigned functions. PMEL managers shall ensure that training of personnel is kept up-to-date and consistent with employee assignments and development.

2.6.1 Training Records. Training records shall be maintained on the relevant qualifications, training, skills and experience of technical personnel. The documentation may be maintained in electronic or traditional format. Regardless of the format, records shall be available and periodically reviewed by the employee and PMEL management.

2.7 PROGRAM INTEGRATION. TMDE requiring support drives all resource needs and normally comes from three sources. They are (A) centrally procured items resulting from a systems acquisition, (B) centrally procured replacement buys, and (C) locally-procured TMDE.

2.7.1 AFMC Centrally Procured TMDE. Close working relationships among the System Program Directors (SPDs), AFMETCAL Det 1's measurement area and systems planners, ALC Commodity Managers, Product Group Managers, Material Group Managers, AETC/TT, and the using commands are necessary to ensure proper planning, programming, budgeting, acquisition, training, and distribution of resources needed to support this TMDE are provided.

2.7.2 Centrally Procured Replacement TMDE. Close working relationships among ALC Commodity Managers, AFMETCAL Det 1 measurement area planners, Product Group Managers, Material Group Managers, AETC/TT, and the using commands are necessary to ensure planning, programming, budgeting, acquisition, training and distribution of resources needed to support this TMDE are provided.

2.7.3 Locally Procured TMDE. The local user/buyer funds support requirements. Before contracting for TMDE, the buyer shall coordinate support requirements with AFMETCAL Det 1. See paragraph 3.6 (TMDE User-Owner Responsibilities) for more information.

SECTION 3

OPERATION

3.1 CALIBRATION OF STANDARDS AND OTHER TMDE. The PMELs, which are maintained, manned, and operated by the MAJCOMS, are responsible for calibrating and/or repairing TMDE specified in applicable CMSs and T.O.s 33K-1-100-1/-2/-2MT-0. They are also responsible for other workload that may be assigned by the MAJCOM. Specific procedures, intervals, and responsibilities for the maintenance, calibration, and certification of standards and TMDE are identified in this T.O., T.O. 33-1-27, T.O.s 33K-1-100-1/-2/-2MT-0, other applicable command directives, and weapon or support system CMS T.O. These procedures shall be used for all TMDE used to make qualitative/quantitative measurements on operational systems and equipment. All measuring and testing equipment having an effect on the accuracy and validity of calibrations shall be calibrated. Any standard or equipment that has exceeded its calibration interval or is otherwise judged unreliable shall be recalled or removed from service.

3.1.1 Calibration Procedure Performance Requirements. In order to assure that valid and accurate calibrations are performed, it is necessary to:

a. Follow authorized calibration procedures.

b. Use qualified personnel.

c. Use equipment called for in the calibration procedure (or substitute equipment with required functions, ranges, and test accuracy ratios).

d. Perform operation in an environmentally controlled atmosphere.

3.1.2 Precedence. Calibration procedure selection shall be made in accordance with the following precedence:

First. Procedure listed in CMS (Applicable to TMDE used solely to support a system referenced in the CMS).

Second. Procedure listed in T.O. 33K-1-100-2/-2MT-0.

Third. General procedure listed in T.O. 33K-1-100-1 Section 3-1, if applicable.

Fourth. Other official DoD calibration procedures.

Fifth. Equipment maintenance T.O.

Sixth. Commercial Publications or Commercial Data.

3.1.3 AFPSL Requirements. The AFPSL evaluates many first-article items and is responsible for acceptance testing of certain new items entering the inventory. This requires some deviation from normal directives since formal 33K procedures may not exist for such items. The process for conducting first-article and acceptance testing shall be documented.

3.1.4 Responsibility Determinations. TMDE calibration and repair responsibility determinations are managed by AFMETCAL Det 1 and are published in CMS T.O.s and T.O. 33K-1-100-2/-2MT-0.

3.1.4.1 Request for Calibration Responsibility Determinations. If the equipment is not listed in the CMS or T.O. 33K-1-100-2/-2MT-0 as prescribed in T.O. 33K-1-100-1, the PMEL shall submit an AFTO Form 45, Request for Calibration Responsibility Determination to AFMETCAL Det 1 in accordance with instructions in Section 5 of this T.O.. The PMEL shall assist the user/owner in maintenance and calibration. However, the maintenance and calibration of the equipment shall be the responsibility of the user/owner and the procuring agency until the calibration responsibility decision is made. While awaiting the calibration responsibility determination, as published in the CMS or 33K-1-100-2/-2MT-0, the item may be calibrated using commercial data.

3.1.4.2 Responsibility Determination Exceptions. There may be instances where individual MAJCOMS may require exceptions from the assigned determination because the capability exists in another organization. Requests to deviate from the assigned calibration responsibility shall be processed through the MAJCOM PMEL Functional Area Manager (FAM). If the FAM accepts the request, the request along with supporting comments shall be forwarded to AFMETCAL Det 1 for review. AFMETCAL's concurrence or non-concurrence shall be forwarded to

the FAM. If AFMETCAL Det 1concurs, the FAM may authorize the PMEL to change their local -100 via message or letter.

NOTE

Email notification is unacceptable. PMEL shall retain the authorization and make it available upon request.

3.1.5 Calibration Equipment Traceability/Accuracy. The overall program shall be designed and operated to ensure measurements are traceable through the AFPSL to NIST or other AFMETCAL Det 1 approved sources. The equipment required to calibrate TMDE is listed in each calibration T.O. Other equipment, which has the necessary functions, ranges, and accuracies, may be substituted to perform the calibration even though they may not have all the characteristics of the listed item. Use T.O. 33K-1-101 to assist in the identification of substitute items. If the accuracy ratio of the equipment specified in the T.O. is better than 4 to 1, substitute equipment shall not lower this accuracy ratio to less than 4 to 1. If the ratio of accuracies is less than 4 to 1, equipment substituted shall have accuracy equal to or better than the equipment specified. EXAMPLE: If the accuracy of the specified equipment is only 2 to 1, the accuracy of the substituted standard must be at least 2 to 1. CAUTION: Care must be taken in determining the accuracy of a given measurement. In many instances, the accuracy of the measurement is not the sum of accuracies of the instruments used. Modification of procedural steps is authorized when substitute equipment is used. However, all parameters, ranges, and accuracies in Table 1 of the calibration T. O. shall be met or exceeded. Questions regarding determination of accuracies shall be directed to the responsible engineer at AFMETCAL Det 1. (See Responsibilities Listing published in AFMETCAL Newsletter). Air Force calibration procedures (33K series technical orders) are designed to ensure calibrations are traceable through the AFPSL to the National Institute of Standards and Technology (NIST) or other AFMETCAL DET 1 approved sources. Air Force calibration laboratories (both PMELs and the AFPSL) shall ensure that any substitution of equipment and subsequent modification of procedural steps does not adversely affect the traceability of the calibration being performed.

3.1.5.1 Calibration Software. When using calibration software, the calibration authority for the measurement shall be established using the order of precedence noted in Paragraph 3.1.2. Normally the calibration authority will be identified in T.O. 33K-1-100-2/-2MT-0. The listing contained in T.O. 33K-1-100-2/-2MT-0 is a record of the AFMETCAL Det 1 calibration determination and identifies the calibration authority for the end item. Normally, the calibration authority is a 33K Series calibration procedure. The calibration authority is cited on the calibration certificate/label. Thus, the calibration of the end item shall satisfy the requirements contained in the calibration authority. Use of calibration software is viewed as a controlled substitution of equipment. The control is established through the documentation and validation and verification requirements noted in Table 3-1. Use of software that has not been properly documented, validated, and verified is prohibited and is grounds for audit failure by either the local PQA or by the visiting AFMETCAL Det 1 certification team. Calibration software is divided into four classes as shown in Table 3-1.

Table 3-1
CALIBRATION SOFTWARE CLASSES

SW Class	Developer	Maintainer	Distributor	Val & Ver	Calibration Authority	Documentation
AFMETCAL CPIN	AFMETCAL	AFMETCAL	AFMETCAL	AFMETCAL	See para 3.1.2	AFMETCAL Generated & Approved
PMEL/ AFPSL CPIN	PMEL/ AFPSL	AFMETCAL	AFMETCAL	PMEL/ AFPSL/ AFMETCAL	See para 3.1.2	PMEL/ AFPSL Generated - AFMETCAL Approved
PMEL/ AFPSL Local	PMEL/ AFPSL	PMEL/ AFPSL	N/A	PMEL/ AFPSL	See para 3.1.2	PMEL/ AFPSL Generated - PQA Approved - Copy of Val & Ver doc shall be kept on file - Notify AFMETCAL of usage
Commercial	Commercial	Acquirer	Acquirer	Acquirer	See para 3.1.2	Acquirer Responsibility - Copy of Val & Ver documentation shall be kept on file - Notify AFMETCAL of usage

3.1.5.1.1 Definitions for Table:

a. Developer: Authors software.

b. Maintainer: Maintains software and is responsible for configuration control and software changes/updates. The Maintainer shall keep the calibration software in agreement with the Calibration Authority.

c. Distributor: Distributes software to users. Updated copies of the calibration software shall be provided whenever the Maintainer accomplishes changes/updates.

d. Validation & Verification: Organization responsible to validate and verify that software satisfies calibration requirements. Validation and verification shall demonstrate and document that the software operates correctly, produces the desired result, cannot be manipulated/changed during operation, and satisfies and is equivalent to the Calibration Authority.

e. Calibration Authority: Calibration requirements as determined by AFMETCAL Det 1 shall be established using the order of precedence noted in Paragraph 3.1.2 Precedence

f. Acquirer: Organization that procures the calibration software.

3.1.5.1.2 Calibration software documentation levels shall be determined by the Maintainer, but shall include as a minimum:

a. End items to be calibrated with the software.

b. Software identification number.

c. Software revision status/number.

d. Calibration authority to be cited (including version date).

e. Software Validation and Verification (Val & Ver) Plan.

f. Validation and Verification results. This documentation shall be maintained throughout the software's life.

NOTE

Software Validation and Verification shall be re-accomplished and documentation updated if the Calibration Authority is changed and/or updated. Calibration software that has not undergone Validation and Verification against the published (official) version of the Calibration Authority or lacking current up to date documentation cannot be used.

3.1.5.1.3 Additionally, the methods used to acquire, develop, maintain, validate and verify, distribute, document and control calibration software shall be addressed in the laboratory's Quality Manual. Copies of the software documentation and the laboratory quality manual shall be available for review by AFMETCAL Det 1 upon request. Upon review, AFMETCAL Det 1 reserves the right to disapprove usage of the software, if it has not been adequately validated and verified, does not have current up to date documentation, does not satisfy or is not equivalent to the Calibration Authority.

3.1.6 Calibration Procedures. AFMETCAL Det 1 shall prepare, maintain, and control content, and issue 33K series technical orders and software for calibrating measurement standards, TMDE, and automated test equipment defined as the responsibility of the PMEL. AFMETCAL Det 1 shall publish and maintain T.O. 33K-1-100-1, Technical Manual TMDE Interval, Calibration, and Repair Technical Order Reference Guide and Work Unit Code Manual. AFMETCAL Det 1 shall ensure:

a. Calibration procedures contain the required range and tolerance or uncertainty of each item or unit parameter being calibrated or verified.

b. The procedures contain a generic description of the measurement standards and equipment needed with the required parameter, range, tolerances or uncertainties, and specifications for performing the measurement, and/or representative types (manufacturer, model, option) that are capable of meeting the generic description for the measurement standards.

c. The procedures are consistent with the accuracy required, and with any standard specifications relevant to the calibrations/verifications concerned.

d. The calibration uncertainties are sufficiently small so that the adequacy of the measurement is not affected. Well-defined and documented measurement assurance techniques or uncertainty analyses may be used to verify the adequacy of a measurement process. If such techniques or analyses are not used, then the collective uncertainty of the measurement standards shall not exceed 25 percent (4:1) of the acceptable tolerance for each characteristic of the measuring and test equipment being calibrated or verified.

3.1.6.1 Locally Developed Procedures. Locally developed procedures shall not be used to perform calibration until approved by AFMETCAL Det 1 and the using command (Ref T.O. 00-5-1). Format of the procedures shall conform to MIL-PRF-38793B and MIL-STD-38784. The writing shall conform to the plain English standards and minimum editorial requirements listed in AFI 37-160 Vol 1. The local procedures shall be routed to AFMETCAL Det 1.

3.1.6.2 Procedure Specifications. 33K Series calibration procedures shall be written to meet manufacturer's specifications whenever possible. The procedure shall direct use of a Limited Certification Label if the parameters listed in Table 1 of the calibration procedure do not meet the manufacturer's specifications. This is to ensure the user/owner of the TMDE is made aware of the deviations from manufacturer's specifications. Table 1 specifications of 33K Series T. O. take precedence over other specifications or tolerances listed throughout the T.O.. Individuals discovering contradictions between Table 1 and any other section of the T.O. shall comply with paragraph 3.1.7.

3.1.6.3 T.O. Verification Process**.** Laboratories shall perform T.O. verification on all new draft calibration procedures received from AFMETCAL Det 1 for review. Guidelines detailing the verification process are outlined in Controlled Multiple Address Letter (CMAL) "Verification of Calibration Technical Order (TO)."

3.1.6.4 Post-Publication Reviews: AFMETCAL Det 1 will perform Post-Publication Reviews on formal T.O. under the following conditions:

a. The T.O. has not been changed for five years.

b. Under the recommendation of the Technical Content Manager (TCM).

c. Under the recommendation of the T.O. Manager due to the number of AFTO 22s received. At the request of the using command Functional Area Manager.

During a Post Publication Review, one or several PMELS may be tasked to participate, either locally or at another site. This tasking shall be at the discretion of the TCM. Reference AFMCI 21-301, T.O. 00-5-1, and T.O. 00-5-3.

3.1.7 Documenting and Reporting Procedure Problems. PMEL Technicians experiencing difficulty in performing calibrations shall contact the appropriate AFMETCAL Det 1 branch for assistance or submit an AFTO Form 22 as necessary. When a calibration procedure (33K) contains an error and an AFTO Form 22 is submitted, the technician shall select an alternate procedure for the affected parameter(s) in compliance with paragraph 3.1.2, and document the calibration authority for the affected parameter(s) in the Special block of the certification label.

3.2 EXCEPTIONS FROM PERIODIC CALIBRATION. Some types of TMDE do not require periodic calibration. They include items not used to make quantitative measurements, TMDE seldom used but must be calibrated before use, items designated as not requiring calibration, and TMDE that requires initial calibration only.

3.2.1 No Calibration Required (NCR) Items. Certain types of TMDE identified as NCR do not require calibration because they do not provide important quantitative measurement information, and/or are accessories to other TMDE or function only as an interface device. Examples are RF receivers traceable to a frequency standard; some automotive test equipment; some pressure regulators, isolators, terminations, loads, adapters, tees, circulators and waveguide components. Exception may occur when such items present an actual workload for the PMEL. Examples: NCR items may require calibration in specific applications, or the user may request calibration of an NCR item. The user shall supply justification for the need. Bar code labels shall not be applied on customer owned NCR items that cannot be repaired unless the item requires periodic calibration. An AFTO Form 256, No Calibration Required label, shall be affixed in accordance with Section 5.

3.2.2 Calibrate Before Use (CBU).

a. TMDE identified by AFMETCAL Det 1 as CBU in a CMS or T.O. 33K-1-100-2/-2MT-0.

b. TMDE that normally is not used at least once during its calibration interval need not be periodically calibrated and may be designated as CBU. New TMDE shall require an initial calibration to ensure it meets requirements before being designated CBU. Previously calibrated TMDE shall not require a recalibration, before CBU designation, unless requested by the user/owner. CBU items shall be calibrated at least once before being designated as CBU. An AFTO Form 99 or 398, whichever is applicable, shall be completed and marked CBU in accordance with Section 5. Calibration of TMDE designated CBU need not be re-calibrated until the TMDE is to be used even though the calibration due date has passed. The CBU designation shall be entered in the PMEL Master Inventory listing in place of the frequency.

NOTE

PMEL cannot make an item CBU without the owner's direction or permission.

3.2.3 No End-Item Calibration (NEC). NEC in the calibration interval denotes TMDE designated SICL (See Individual Component Listing) in a CMS or T.O. 33K-1-100-2/-2MT-0, that does not have an end-item-calibration requirement. NEC only applies to the end-item; not subcomponents listed with separate calibration intervals.

NOTE

For scheduling systems that have not been updated to process NEC, load as NCR.

3.2.4 Next Higher Assembly (NHA). NHA in the calibration interval field of a CMS or T.O. 33K-1-100-2/-2MT-0 denotes subcomponents that are calibrated as part of a next higher assembly. The calibration interval and calibration T.O. of the next higher assembly apply unless otherwise noted. NHA items shall not generate a separate "due calibration" in addition to the end item. The next higher assembly calibration sticker applies to all subcomponents designated NHA.

NOTE

For scheduling systems that have not been updated to process NHA,load as NPC so only the next higher assembly is scheduled for calibration.

3.2.5 No Periodic Calibration Required (NPC) Items. Based on its applications (see below), an individual unit of TMDE may not require periodic calibration. Even though it belongs to a part number group that normally requires calibration per a CMS or T.O. 33K-1-100-2/-2MT-0, it may be designated as NPC. The TMDE user/owner exercises the option of designating an item NPC by contacting the PMEL with the request that a specific item be made NPC for one of the reasons listed below. This TMDE shall require an initial calibration to ensure it meets requirements of the applicable calibration T.O.. The unit shall not require another calibration if the user/owner wants to designate the item NPC at a later date. This TMDE shall require calibration after repair is accomplished. AFTO Form 99 or 398 shall be completed and affixed to the TMDE. TMDE designated as NPC shall be identified in the PMEL Master Inventory Listing as NPC where the frequency is normally entered. The TMDE user/owner may designate an item NPC if either:

a. Its performance is verified, checked, or monitored by other certified TMDE.

b. It does not affect safety and is not used to verify equipment performance factors or make absolute measurements.

NOTE

PMEL cannot make an item NPC without the owner's direction or permission.

3.2.6 Training Equipment. TMDE used solely for training and not used to verify specifications or performance factors of operational weapon/support systems or does not affect safety may be identified as NPC. Calibration shall be performed if management determines it is required for contingency purposes. Calibration after repair of TMDE used for training and designated NPC is optional based on agreement between user/owner and the PMEL flight chief. Instructors shall remove, or annotate malfunctions implanted for training purposes prior to processing any TMDE for repair or calibration. Instructors shall ensure TMDE coded NPC with inoperative functions or ranges is processed for repair before the item becomes totally inoperative. TMDE requiring calibration shall use the interval specified in the applicable CMS, if appropriate or T.O. 33K-1-100-2/-2MT-0. TMDE used for training and identified as NPC shall have an AFTO Form 99 or 398 attached. The Standard Reporting Designator (SRD) for resident training TMDE is "HTE". All other TMDE shall use normal SRD reporting codes.

3.2.7 Initial Calibration Only (ICO). Due to its inherent design features, TMDE designated ICO does not require periodic calibration. This TMDE shall be calibrated when initially entering service, or if necessary to meet required specifications after repair. An exception is an absolute standard, which does not require any calibration. Retain report of measurement or certificate of calibration from NIST, AFPSL, PMEL (when PMEL has measurement capability) or original equipment manufacturer (OEM) on file in the PMEL until the TMDE is no longer needed. A properly completed certification label and supporting data is sufficient for ICO items certified by the PMEL. The ICO category also includes certified reference materials or samples which might be obtained from NIST or other sources.

3.2.8 Depot or Base Supply Stocks. Except for the following situations, items in depot or base supply stocks do not require periodic calibration. Items of TMDE that are an integral part of an automatic test station and are maintained

as spares in a forward supply point shall be calibrated prior to turn-in to supply and thereafter at their designated calibration interval unless another interval is prescribed in the applicable weapon summary. The items shall be tested in the station if possible.

3.3 LIMITED OR SPECIAL CALIBRATION.

3.3.1 Limited. There are several situations where the PMEL may be authorized to perform a limited calibration. These situations require the use of an AFTO Form 99 or 398 Limited TMDE Certification label. The authorization for a limited or special calibration shall be documented in the USER APPROVAL block of the AFTO Form 99 or in the INI block of the AFTO Form 398 in accordance with Section 5.

3.3.1.1 T.O. Directed Limited Calibration. Limitation can be identified in the calibration procedure. The procedure can contain a statement such as "The Test Instrument accuracy has been downgraded from the manufacturer's specifications due to a lack of adequate standards" and direct use of the limited calibration certificate.

3.3.1.2 Limited PMEL Capability. When a PMEL does not have the capability to calibrate the full range of specifications contained in the calibration procedure or maintenance T.O., the PMEL supervisor shall advise the using activity of the extent of services available. The using activity shall decide if the available service meets the mission requirements. If the limited calibration service does not meet their needs, the using activities shall advise the PMEL, and action shall be taken in accordance with paragraph 4.1.

3.3.1.3 Limited User Requirement. When a user requires less than the full capability of the TMDE, the user shall specify the desired calibration points or ranges to the PMEL. The PMEL shall clearly identify the certified points or ranges (or the limitations) on the instrument's certification label (AFTO Form 99 or AFTO Form 398 or the form that accompanies them).

3.3.1.4 Instrument Limitation. When a function, range, or specification on a multi-function instrument cannot be economically restored to original design specifications, the PMEL supervisor shall advise the using activity of the condition. The user shall then decide if the missing function is necessary to support the mission or if a replacement item is needed. If a limited calibration can permit proper mission support, the PMEL can perform the limited calibration. If not, the item shall be returned to the owner, with the appropriate condition tag affixed in compliance with T.O. 00-20-3.

3.3.1.5 AFPSL Limitation. If the AFPSL cannot perform a complete calibration because the capability does not exist to calibrate the item to full manufacturer's specifications, the AFPSL may perform a limited calibration. Document all such limitations on an AFTO Form 99. The limitation shall be identified (documented) in the procedure.

3.3.2 Special. When a special calibration is performed, the ability of the test instrument to maintain accuracy through the calibration interval is questionable and the owner/user shall be notified of the inherent risk. A typical special calibration includes an extra data point(s) such as a special frequency or reading that is not in the calibration procedure. They may also be:

a. Calibration of an item designated as NCR.

b. Calibration of a unit to a higher accuracy than specified in the calibration procedure. In this case, the unit must be capable of providing the higher accuracy within manufacturer's specifications. Whenever possible, performance specifications shall be consistent with the manufacturer’s specifications (MIL-PRF-38793B, paragraph 3.2.2.2). If they are not, the calibration procedure shall identify any deviations from manufacturer’s specifications.

c. Calibration of an item that has no identifiable manufacturer or part number. In this case the owner/user shall submit, in writing, a special calibration request that includes range and accuracy required and a documented reference (T.O., Test Program Set, test plan, etc.). Laboratory personnel shall determine if the test instrument is capable of supporting the required measurement. If there is reasonable doubt of Test Instrument capability, the item shall not be calibrated. When calibrated, the Test Accuracy Ratio shall be at least 4:1. The certified accuracy must not exceed the Table 1 specifications of the general calibration procedure used as per T.O. 33K-1-100-1. The certified accuracy shall be annotated on the certification label.

3.3.2.1 PMEL Special Calibration. The PMEL shall contact AFMETCAL Det 1 for direction when there is a 33K-series calibration procedure written with uncertainties downgraded from the manufacturers stated uncertainties and there is a need to certify TMDE to the manufacturer specifications.

3.3.2.2 AFPSL Extended Calibration. To meet Air Force requirements, the AFPSL may perform special calibrations that exceed manufacturer's ranges and/or specifications. In such cases, specific details of the extended calibration shall be documented and published in the calibration procedure if the extended calibration is an ongoing occurrence. An AFTO Form 108 shall be used by the AFPSL in these instances. An uncertainty analysis shall be performed and documented to substantiate the uncertainties published.

3.4 CALIBRATION INTERVALS. The Air Force calibration interval (calibration cycle) listed a CMS or T.O. 33K-1-100-2/-2MT-0 is the period of time over which the equipment shall perform its mission (or function) with a statistically derived end-of-period reliability (shall be within tolerance) of 85% or better. These intervals are established, and modified as necessary, from data collected through the maintenance data collection system on the total TMDE population. TMDE that has exceeded the prescribed calibration interval shall not be used. However, the date due can be extended in certain cases. Paragraphs 3.4.9 through 3.4.14 identify those cases.

3.4.1 Precedence for Calibration Intervals. For published TMDE calibration intervals, the precedence is:

a. Weapons system or Subsystem CMS T.O.

b. T.O. 33K-1-100-2/-2MT-0.

c. Individual maintenance T.O.s.

3.4.2 Intervals for New Items and Items Listed without a Calibration Interval. The maximum calibration interval for TMDE is 12 months when an interval is not prescribed by a T.O..

3.4.3 Published Calibration Interval Changes. It is not mandatory that TMDE be rescheduled or recalled for calibration or update of certification solely because a change to a calibration interval is published. A calibration interval may be shortened by the PMEL based on calibration mobility team schedules, PMEL workload, or excessive unscheduled maintenance. Items changed from NCR, ICO, or CBU to a periodic calibration interval shall be removed from service and recalled to the PMEL and calibrated. When large quantities are involved, the recall should be staggered to maintain an even flow of workload into the PMEL.

3.4.4 Other Reasons for Changes. TMDE owners may request recalibration of their TMDE any time there is reason to question the accuracy of the instrument. Items exposed to rough handling, overload, or other severe conditions shall be removed from service and recalibrated regardless of the calibration due date. TMDE users may request shorter calibration intervals to meet mission requirements. They may also request special calibration of NCR items if they are used to accept or reject items.

3.4.5 Recommending Changes to Calibration Intervals. Air Force activities that have accumulated data to substantiate a change in calibration intervals may submit this data and the recommended changes to AFMETCAL Det 1. Interval changes must be approved by AFMETCAL Det 1.

3.4.6 War Reserve Equipment Intervals. TMDE to be placed in War Reserve Material (WRM) kits shall be calibrated prior to packaging. Calibration intervals for TMDE in WRM kits do not start until the units are unpacked for use. A WRM kit package or container is stamped with a calibration due date equal to 18 months from the earliest date packed. TMDE that is not removed from the package and whose accuracy is not in question need not be calibrated until the 18-month period marked on the package has expired. Any obvious damage to the equipment package would be cause to recalibrate the TMDE. Once removed from the package, all items shall revert to their normal interval. Due to the many unforeseen circumstances that could arise from storing equipment in relatively uncontrolled areas, 18 months has been determined as the maximum time WRM equipment could be stored with a reasonable expectation that the equipment will operate within the specifications of the calibration procedure. In lieu of storing TMDE in WRM kits, TMDE may be individually tagged and placed in a stringently controlled, limited-access area(s). When an item of TMDE is removed from this controlled area, calibration interval reverts to the interval specified in the CMS or T.O. 33K-1-100-2/-2MT-0. The following paragraph identifies items that cannot be stored in WRM kits, or require special precautions.

3.4.6.1 Items that either can't be stored in WRM kits or require special precautions:

a. GAS DETECTORS CONTAINING SENSORS WITH A SHORT SERVICE LIFE – Ensure the Sensor service life covers the maximum possible projected storage period.

b. RADIAC DOSIMETERS - Those that need to be recharged periodically (usually 30 days) shall not be placed in long time storage.

c. STANDARD CELLS - A period of weeks is required to obtain accurate voltage readings.

d. CESIUM BEAM FREQUENCY STANDARD - Cesium Beam Tube would be ruined if it were turned off more than 90 days. The ion pump could not keep the tube evacuated.

e. NI-CAD BATTERIES - Shall require recharging after 18 months in storage.

f. TEMPERATURE BATH - Drain oil before storing.

g. DEADWEIGHT TESTER - Drain oil before storing.

h. VACUUM SYSTEM - Drain oil before storing.

i. HYDRAULIC FORCE PRESS - Drain oil before storing.

j. HOOK GAGE - Drain water before storing.

k. PNEUMATIC PRESSURE STANDARDS AND LO PRESS GAGES - Require dry nitrogen source to use.

l. ALKALINE BATERIES - Remove from equipment prior to storage.

3.4.7 Foreign Military Sales Equipment. Calibration due dates may be adjusted in the following manners:

a. AFMETCAL Det 1 may delay the start of calibration intervals for Foreign Military Sales (FMS) items (except for those items specified by Metrology engineers) being assembled to meet foreign country PMEL activation dates to agree with the activation date or other milestones.

b. FMS customers may adjust calibration intervals if shipping time to country is in excess of fifteen days. The following rules apply:

(1) Receipt in-country must be recorded and filed.

(2) The number of shipping days consumed will advance calibration Due Dates when:

- Interval is equal to or less than 90 days. May be adjusted up to 45 days.
- Interval is more than 90 days. May be adjusted up to 60 days.
- No interval may be adjusted by more than 60 days.

3.4.8 Coding of TMDE Subject to Deployment. TMDE that is subject to deployment shall be identified as Mobility or WRM on the master inventory. This shall be accomplished by entering the code in the ON-MOBILITY field of the PMEL Automated Management System scheduling screen. The PAMS Mobility Field Codes are contained in T.O. 33K-1-100-1, Section 2.

3.4.9 Measurement Standard Intervals. The calibration interval for Air Force base measurement standards sent to PMEL in exchange for standards due for certification may be up to 60 days longer than the calibration interval listed in the 33K-1-100-2/-2MT-0 to account for administrative and transit time. The date calibrated on the unit shall reflect the actual date of calibration. The date due shall be established as the 28th day of the month in which the item is due for recertification. These dates shall not be changed by the PMEL without direction from the AFPSL. AFMETCAL Det 1 is responsible for authorizing the extension of calibration due dates of Air Force measurement standards used by the AFPSL.

3.4.10 Test Project Equipment Interval Extensions (excluding RADIAC equipment). TMDE that is assigned a periodic calibration interval may have its due date extended by mutual agreement between the test director and the PMEL chief, if calibration of the TMDE would adversely affect a test. The due date may be extended to the end of the test or an additional 50 percent of the assigned interval, whichever is less. The test director must verify that the extension is at their request, and the PMEL is no longer responsible for the accuracy of the TMDE in the test setup.

3.4.11 Critical TMDE Interval Extensions (excluding RADIAC equipment). MAJCOMs may authorize extensions of the calibration due date if the loss of the TMDE will delay or prevent critical mission accomplishment. Requests for extensions shall be forwarded to the command PMEL Functional Area Manager (FAM). The request shall describe the TMDE involved, the calibration due date, the specific reasons calibration cannot be accomplished as scheduled, and the estimated date calibration action can be initiated.

3.4.12 Base Measurement Standard Interval Extension. The command PMEL Functional Area Manager is responsible for authorizing the extension of the calibration due date of Air Force base measurement standards

provided by AFMETCAL Det 1 to the PMELs. AFMETCAL Det 1 shall receive information copy of extensions of base measurement standards' intervals. The NRC does not control calibration Intervals for RADIAC standards.

3.4.13 On-Site Equipment Due Dates. The calibration due date of TMDE calibrated on-site and off-base may be extended up to ten days by the PMEL supervisors to facilitate scheduling.

3.4.14 Adjustment of Calibration Due Dates. PMEL Managers have the authority to adjust calibration due dates up to one month to offset return transportation time or scheduled TFCU visits. This is not blanket authority to extend all items in the inventory, but shall be used only on a case-by-case basis.

3.5 PRECISE TIME SUPPORT.

3.5.1 Support Responsibility. PMELs shall provide precise time support (or calibration) to their area customers when they have the capability. Otherwise, they shall assist in obtaining support from the nearest PMEL having the capability. If support is not available in the geographic area, AFMETCAL Det 1 shall either provide the service or arrange for it to be accomplished. The following PMELs are designated as a Precise Time and Reference Station (PTRS) or have been provided a precise time and frequency console:

a. Vandenberg covers that part of the Western Range they now support plus their California customers.

b. RAF Feltwell presently supports customers in England.

If it becomes cost effective to change these assignments, contact AFMETCAL Det 1.

3.5.2 Clock Technical Repair Center (TRC). The Technology and Industrial Support Directorate (OC-ALC/TI), Tinker AFB OK, is the TRC for the Cesium Beam Frequency Standards (Atomic Clocks). Users shall use the Standard Base Supply System (SBSS) IAW AFMAN 23-110 Vol 2/Part 2, Chapters 21 and 22, and Vol 2/Part 13 for maintenance. Contact your host base Equipment Management Element (EME) for assistance on turn-in of repairables and request for replacements. Those users that have embedded clocks in their systems need to ensure a "P" is in column 30 of their Air Force Form 2005, and state in the remarks block "This is a component part of NSN _____" which is on their Allowance Source.

3.6 TMDE USER-OWNER RESPONSIBILITIES. The user-owner shall:

a. Appoint a TMDE coordinator. A TMDE coordinator is not required at locations where the PMEL supports only one organization. The TMDE coordinator shall attend training and maintain a TMDE coordinator file that includes:

(1) Name of primary TMDE coordinator and alternate.

(2) OWC Master ID Listing. Not required in the PMELs TMDE coordinator file.

(3) OWC Master Equipment Schedule.

(4) Test equipment hand receipts from PMEL. Not required in the PMELs TMDE coordinator file.

(5) A copy of the base instruction, if applicable. Not required in the PMELs TMDE coordinator file.

(6) Any customer handout(s) that might be provided by PMEL. Not required in the PMELs TMDE coordinator file.

NOTE

Customers (at least the coordinators) shall have access to and be familiar with contents of T.O. 33K-1-100-1, T.O. 33K-1-100-2, T.O. 00-20-14, any applicable CMS T.O.s, T.O. 00-25-234, T.O. 33-1-27 and T.O. 33-1-32. Preferably, coordinators of large accounts shall maintain their own copy of these T.O.s.

b. Calibrate, certify, and repair TMDE specified in any applicable CMS T.O.s or T.O. 33K-1-100-2/-2MT-0 as a USER responsibility. If they do not have the capability, obtain calibration and maintenance support from the lowest echelon organization having the capability. If no other organization has the capability, the PMEL shall assist by providing training, workspace, technical assistance, or support, as required.

c. Request approval from AFMETCAL Det 1 prior to obtaining calibration of Air Force TMDE from commercial sources.

d. Accomplish and use applicable forms, labels, and alternate methods of certification IAW Section 5 of this T.O.

e. Return all TMDE specified as PMEL or AFPSL responsibility in any applicable CMS T.O.s or T.O. 33K-1-100-2/-2MT-0 to the PMEL when scheduled for calibration or for unscheduled maintenance. Commanders and supervisors of all activities owning and using TMDE requiring calibration are responsible to ensure this TMDE is not used unless it has been calibrated and that it is removed from service once the calibration due date has expired. Exception to this statement only as covered by para 3.4.9 through 3.4.14.

f. Consider alternative of limited calibration, CBU, or NPC status, where possible.

g. Deliver TMDE to the PMEL with all ancillary equipment (e.g., preamps, power supplies, adapters, cables, or probes) needed for the calibration. PMEL personnel shall advise the user/owner when an item is not sufficiently complete to allow full calibration and may return the item without action if the ancillary equipment and/or technical data are not readily available.

h. Provide proper care, handling, cleanliness, and transportation (see para 3.7) of TMDE.

i. Ensure that notes contained in the SPECIAL block of the calibration labels are read and understood.

j. Refer measurement standards authorized for use by activities other than the PMEL to the base PMEL for calibration. The base PMEL shall either calibrate these items or request assistance in accordance with paragraph 4.1. Measurement standards owned by research and development laboratories and used to support measurement areas peculiar to a specific PMEL may be used to calibrate TMDE that cannot be supported by the PMEL. The PMEL is responsible for ensuring these standards meet certification requirements.

k. Maintain technical data file for equipment owned. Provide technical data with the TMDE when requested by the PMEL. The TMDE User/Owner shall ensure adequate maintenance and technical data for each item of TMDE are available and that the technical data accompany their TMDE whenever they are deployed.

l. Request assistance from the base PMEL for calibration of individual items of TMDE that require equipment and technical skills normally in the PMEL. Also request PMEL help when specified in the applicable weapon system or equipment CMS T.O.. Ensure that TMDE used as component parts of systems or subsystems (i.e., B-52, AN/FPS-27, etc.) are not removed for calibration unless the system, subsystem, maintenance, or CMS T.O. requires it.

m. Identify and/or coordinate any requirements for limited or special calibrations with the base PMEL. Comply with procedures for exceptions from periodic calibration as specified in paragraph 3.2. Place authorizing signature on AFTO Form 99 or place initials on AFTO Form 398 in accordance with Section 5. This is to be done for TMDE that has received limited or special calibration when returned from the PMEL, or for TMDE that is to be exempted from periodic calibration.

n. Request calibration assistance as outlined in paragraph 4.1 when assistance is required.

o. Perform organizational maintenance on assigned TMDE in accordance with T.O. 33-1-27. This responsibility applies to stock listed and nonstock listed TMDE in all federal supply classes.

p. Remove AFTO Forms (108, 394, 99, or 398) from units being returned to supply stocks and notify PMEL of the turn-in. AFTO Forms 108, 394, 99, or 398 on items withdrawn from supply are invalid except for those on Redistribution Order actions. AFTO forms 65 and 66 stay on equipment.

q. Leave all condition tags and other documentation including warranty tags (except the receipt) on TMDE being forwarded to the PMEL for initial calibration or acceptance testing and retain shipping containers. The initial calibration is a serviceability check on items from a vendor, technical repair center, or other base. Discrepancies found by the PMEL during initial calibration shall be reported to the owners so they can submit deficiency reports back to the source of supply. A calibration procedure can serve as a guideline for an acceptance check.

r. Provide adequate facilities for TFCU or other PMEL mobile calibration operations.

s. Ensure that torque-indicating devices, specified as PMEL responsibility in T.O. 33K-1-100-1/-2 or any applicable CMS T.O., are sent to the PMEL for scheduled calibration or unscheduled maintenance. Torque

indicating devices are considered TMDE and PMELs are assigned the primary responsibility for calibration and repair. If not collocated on an installation with a PMEL, User/Owner organizations, through their PMEL MAJCOM FAM, may request authorization from AFMETCAL Det 1 to support their own torque devices. AFMETCAL Det 1 will review the request and render a decision. Approved User/Owner Torque Calibration and Repair Sites will be listed in Section 10. The requesting organization shall comply with the following requirements to receive an authorization:

(1) Ensure torque devices are calibrated per any applicable weapon system Calibration and Measurement Summary (CMS) or T.O. 33K-1-100-1/-2.

(2) Ensure torque devices NOT covered by the exemption, and NOT owned by the organization are sent to an AFMETCAL Program PMEL for calibration and repair support.

(3) Ensure all personnel that perform torque calibration and repair are properly trained.

(4) Ensure only AFMETCAL Det 1 approved calibration standards are used, that they are properly maintained, and that they are calibrated by an AFMETCAL Program PMEL.

(5) Collect and report maintenance data to AFMETCAL Det 1, as requested.

(6) Participate in AFMETCAL Det 1 proficiency testing, as required.

(7) Implement a quality program, and participate (as required) in the AFMETCAL Det 1 evaluation program.

(8) Report the inventory of torque devices supported to AFMETCAL Det 1, as requested.

(9) Submit a completed torque calibration site worksheet with authorization request.

t. Return special weapons test equipment designated as PMEL responsibility to the base PMEL for calibration and repair. The PMEL has the responsibility to repair and calibrate Air Force and Nuclear Regulatory Commission (NRC) designated nuclear ordinance commodity managed test equipment. This is meant to include all test equipment that contains radioactive material.

u. Ensure that medical equipment is referred to the appropriate support activity in accordance with AFMAN 23-110 and T.O. 33K-1-100-1. TMDE locally purchased by the hospital requiring PMEL support shall be coordinated with the PMEL prior to purchase to ensure supportability.

v. Ensure that Skydrol fluid pressure gages are calibrated using a Skydrol fluid pressure standard. The gage user/owner is responsible for calibrating these gages.

w. Ensure users do not reset adjustments/potentiometers that are sealed with an AFTO Form 255. "NOTICE CERTIFICATION VOID WHEN SEAL IS BROKEN." Any unit discovered with a broken AFTO Form 255 shall be removed from service and submitted for recalibration.

x. Ensure that components of complex TMDE (test stands, checkout consoles, etc.) are not removed for calibration merely because the components are listed individually in T.O. 33K-1-100-2/-2MT-0. Removal of these components for calibration shall be accomplished only as specified in the maintenance T.O. Complex TMDE components that require calibration shall be calibrated in place, if feasible. Components that require calibration by the PMEL shall be calibrated in accordance with the provisions of a CMS or T.O. 33K-1-100-2/-2MT-0. Typical items are pressure gages, panel meters, power supplies, frequency meters, etc. To preclude excessive down time, each component shall be calibrated at the shortest interval listed for any of the components, or at a multiple of the shortest interval, if this multiple does not exceed its own listed interval. For example, if the shortest interval is 120 days, an item with a 270 day interval may be checked every 120 days or it may be shortened to 240 days and checked every other time.

y. Prior to the ‘local purchase’ of TMDE:

(1) Coordinate with PMEL to verify there is no existing TMDE that can be used to satisfy the requirement as soon as a part number or model number is available.

(2) Coordinate with PMEL to determine if the item is already listed in a CMS or T.O. 33K-1-100-2/-2MT-0. Perform action in next paragraph if it is not listed.

(3) Assist PMEL in completing the Request for Calibration Responsibility Determination per Section 5 and provide the necessary commercial data.

(4) Provide funding for resources needed to support locally procured TMDE. This includes funding for repair and calibration when locally procured TMDE is beyond the support of the local PMEL.

(5) Process deficiency reporting to source of supply when locally procured TMDE fails initial calibration or acceptance testing.

(6) Follow the guidance in AFI 64-117, AF Government –Wide Purchase Card Program, when using a Government Purchase Card to local purchase TMDE.

z. Provide PMEL with mission impact statements for AWP follow-ups.

aa. Perform all periodic maintenance or inspections as directed by maintenance T.O.s.

bb. Notify PMEL the day items are removed from WRM packages and placed into use. Complete the date due block of the certification label. PMEL may be contacted for assistance in calculating the date due. Date due shall be dependent upon calibration interval stated in the T.O. 33K-1-100-2/-2MT-0 or applicable weapons summary.

cc. Ensure all forms, labels, and calibration correction charts received with the TMDE from the PMEL are complete. Notify the supporting PMEL of errors encountered.

dd. Identify all TMDE that is designated as WRM or subject to deployment. This information shall be provided to servicing PMEL to be included on master inventory.

ee. Provide PMEL information regarding the use made of RADIAC equipment to permit PMEL to determine calibration interval. To be precise, is it NDI equipment, disaster preparedness, or medical equipment?

ff. Remove batteries from FSC 6665 RADIAC equipment being sent to a PMEL that does not affect the calibration of the unit.

gg. Maintain warranty information on all TMDE and document start and stop dates and other warranty conditions.

3.7 CARE OF TMDE. Activities owning and using TMDE are responsible for its proper handling, transportation to and from designated drop off points, care, use, and cleanliness. These are important factors in ensuring that TMDE performs reliably within specified tolerances for the duration of the established calibration interval.

3.7.1 Physical characteristics of TMDE. Physical characteristics of TMDE range from sturdy to delicate. The sturdy can be outer cases with shock suppression mountings. The fragile can be components that can be damaged by a slight jolt, scratch, or static electricity. Special handling instructions for specific items are prescribed in maintenance T.O.s when handling requirements exceed normal practice. Electrostatic Discharge (ESD) control procedures are described in DoD Handbook 263, DoD-STD 1686, and T.O. 00-25-234.

3.7.1.1 Items of TMDE shall be handled as "delicate instruments" regardless of outer physical appearance.

3.7.1.2 Two persons shall carry TMDE that is too heavy to be carried by one person (AFOSH STANDARD 91-46). If two persons cannot safely carry TMDE, a suitable mechanical device shall be used.

3.7.1.3 Items of TMDE shall be handled individually unless the item's size and physical characteristics allow it to be held in one hand.

3.7.1.4 External cords, cables, accessories, and special connectors shall be secured to the case before movement.

3.7.1.5 All unmated connectors shall be kept covered with moisture-proof and vapor-proof caps. Exceptions are when stored in environmentally controlled areas, or if subject to use on a daily basis. Unmated connectors on units that contain circuitry susceptible to ESD damage shall be covered with conductive caps (Ref T.O. 00-25-234, para 7-8a). Do not substitute the use of tape for the caps.

3.7.1.6 Metal-to-metal contact between TMDE items shall be avoided unless the total instrument is contained in a protective case.

3.7.1.7 Only TMDE awaiting work, in delay status or delivery to the customer shall be stored in the PMEL receiving and shipping areas. If a portion of the area is used for other purpose(s), the area shall be well marked as to status or purpose of use.

3.7.1.8 All TMDE shall be stored on shelves or racks unless the physical characteristics prevent this type storage. Items of TMDE constructed so that the instrument is completely contained in a case may be stored on metal or wooden shelving without further protection. Care must be taken to protect protruding dials, knobs, or meter faces. TMDE not constructed in cases shall be protected from damage by use of suitable containers and appropriate padding. Containers, protective caps and coverings, and padding are not required for equipment in work or subject to use on a daily basis. Items of TMDE completely contained in packing cases may be stored on the floor.

3.7.1.9 TMDE that has been subjected to overloading or mishandling, or which gives suspect results, or has been shown by verification or otherwise to be defective, shall be taken out of service. Then clearly identified and whenever possible stored at a specific place until it can be serviced and recalibrated if necessary.

3.7.2 Transportation of TMDE. Transportation of TMDE by trained personnel using a regularly assigned and specially configured vehicle will provide the maximum degree of protection to the equipment. Physical characteristics of individual TMDE shall dictate the extent of protection required during transportation. In general, protection from the elements and excessive shock and vibration is all that is required for TMDE in a protective case. Padding protection between items on the same vehicle may be required to protect knobs, dials, and meter faces from damage if the load shifts.

3.7.3 Cleaning TMDE. The user or owner shall clean the exterior of all TMDE immediately before transporting to the PMEL. TMDE may be returned to the user/owner for cleaning. When an item is disassembled in the calibration area of the PMEL and found to be dirty internally, the calibrating technician shall return the item to the cleaning room. Dust removal may be done in the calibration area by vacuuming only. Techniques for cleaning electronic equipment are provided in T.O. 00-25-234. These techniques may also be applied for electro-mechanical and physical standards when applicable. Oxygen TMDE shall be certified as clean by the user/owner prior to shipment to the PMEL.

NOTE

Oxygen gages shall contain the warning OXYGEN-USE NO OIL printed on the face of the gage by the manufacturer or by use of the OXYGEN- USE NO OIL decal part number 69A52267 (T.O. 15X-1-102) or an equivalent statement of oxygen service. The statement "Not Oxygen Clean" shall not be required on the certification label for gages not identified by the OXYGEN-USE NO OIL warning or decal.

3.7.4 PMEL Tracking of TMDE. Each item of equipment shall be labeled, marked or otherwise identified to indicate its calibration status. Records shall be maintained of each item of equipment and all materials significant to the calibrations or verifications performed. The records shall be stored and held secure and in confidence to the customer for a minimum period of one year or the length of one calibration interval if the calibration interval exceeds one year. The intent is to have at least the last record in the file. The records shall include as a minimum:

a. Nomenclature

b. Manufacturer, type identification, and serial number or other unique identification

c. Current location, where appropriate

d. Where applicable, date calibrated, results of calibration and/or verifications, and date due calibration

e. Details of maintenance carried out to date and planned for the future

f. History of any damage, malfunction, modification or repair

g. The identity of the certifying technician

3.7.5 PMEL Handling of TMDE.

a. The PMEL shall have a documented system for uniquely identifying the items to be calibrated, to ensure there can be no confusion regarding the identity of such items at any time.

b. Upon receipt of the TMDE for calibration, any abnormalities or departures from standard condition as prescribed in the relevant calibration method shall be recorded on an AFTO Form 350 or equivalent document. Where there is any doubt as to the item's suitability for calibration, where the item does not conform to the description provided, or where any limited or special calibration required is not fully specified, the PMEL shall consult the customer for further instruction before proceeding. The PMEL shall establish whether the item has received all necessary preparation, or whether the customer requires preparation to be undertaken or arranged by the PMEL.

c. The PMEL shall have documented procedures and appropriate facilities to avoid deterioration or damage to the calibration item during storage, handling, preparation, and calibration. Any relevant instructions provided with the item shall be followed. Where items have to be stored or conditioned under specific environmental conditions, these conditions shall be maintained, monitored, and recorded where necessary. Where a calibration item or portion of an item is to be held secure (for example: for reasons of record, safety or value, or to enable check calibrations to be performed later), the PMEL shall have storage and security arrangements that protect the condition and integrity of the secured items or portions concerned.

d. The PMEL shall have documented procedures for the receipt, retention or safe disposal of calibration items, including all provisions necessary to protect the integrity of the PMEL.

3.7.6 Computers and Automated Equipment Where computers and automated equipment are used for the capture, processing, manipulation, recording, reporting, storage, or retrieval of calibration data, the PMEL shall ensure that:

a. Computer software is documented and adequate for use.

b. Procedures are established and implemented for protecting the integrity of data. Such procedures shall include, but not be limited to, integrity of data entry or capture, data storage, data transmission and data processing.

c. Computer and automated equipment is maintained to ensure proper functioning and provided with the environmental and operating conditions necessary to maintain integrity of the calibration data.

d. Appropriate procedures for the maintenance and security of data, including the prevention of unauthorized access to and amendment of computer records are established and implemented.

3.8 PMEL MOBILE/ON-SITE MEASUREMENT CAPABILITIES.

3.8.1 Transportable Field Calibration Unit (TFCU). The TFCU consists of working standards, TMDE, and accessories. These items are mounted in shockproof transportable cases. The cases serve as equipment racks during operation and provide protection during transit. The TFCU is used to augment a PMEL to provide on-site calibration support. The PMELs that possess and operate TFCUs are identified in Section 10.

3.8.1.1 TMDE with accuracy requirements beyond the capability of the TFCU shall be returned to the host PMEL. TMDE that needs more than minor maintenance shall normally be returned to the host PMEL.

3.8.1.2 A TFCU shall be considered for assignment to specific PMELs on a case-by-case basis to accomplish the following:

a. Provide calibration support to established Air Force and DoD agencies remotely located from a host-base PMEL.

b. Provide interim or emergency TMDE support at remote sites and bases where operating units have been deployed and where no support PMEL exists.

c. Permit PMELs to maintain and operate calibration support capabilities within prescribed geographic areas.

d. Provide calibration support at a location where an operation does not justify the establishment of a PMEL because of its limited size and workload.

e. Provide temporary support to augment a base PMEL during facility renovations, construction, natural disasters, or loss of environmental systems.

3.8.1.3 Requests for authorization for a TFCU or redistribution of a PATEC shall be submitted through command channels to AFMETCAL Det 1 with an information copy to HQ USAF/ILMM. The requests shall include the following:

a. Identify the proposed owning activity, the purpose for which the TFCU (or PATEC) shall be used, and how it shall be supported.

b. Model or part number, manufacturer, nomenclature, and quantity of TMDE that requires on-site support.

c. The official military designation, squadron or unit, and major command for each activity that shall receive TFCU support.

d. The geographic location of each customer and distance from the host PMEL.

e. Alternate course(s) of action to provide support if the TFCU (or PATEC) is not authorized.

f. Statement of mission impact if a TFCU (or PATEC) is not obtained.

3.8.1.4 PMELs that have lost their on-site customers, which justified their need for a TFCU (or PATEC), shall contact AFMETCAL Det 1, and the command PMEL Functional Area Manager, for disposition instructions.

3.8.1.5 Any calibration support requirements that cannot be met within the above guidelines shall be returned to the main operating base for support.

3.8.2 Electronic Standards Set (ESS). The ESS consists of working standards, TMDE, and accessories selected to support measurement requirements of certain weapon systems in both fixed and deployed situations. The AN/TSM-131 Electrical Standards Set (ESS) supports the F-15 aircraft while the AN/TSM-138 ESS supports the F-16 aircraft. The specific equipment contained in the AN/TSM-131 is listed in T.O. IF-15A-37 and 33D2-27-59-1 while the equipment in the AN/TSM-138 is listed in T.O. IF-16A-37 and 33A1-3-518-1. The AN/TSM-131 and AN/TSM-138 temperature and humidity limits for the Type IV PMEL are listed in Section 8 of this T.O.. The working standards, TMDE, and accessories are functionally grouped in shockproof transportable cases that serve as equipment racks during operation. They also provide protection during storage and transit.

3.8.2.1 Calibration of TMDE using the ESS shall be performed in accordance with the weapon system CMS or 33K T.O.s. If TMDE cannot be calibrated to the specifications in these publications, it shall be calibrated to meet the system/equipment performance requirements identified by the system/equipment maintenance officer (reference paragraph 3.3, Limited Calibration). TMDE with accuracies essential to mission requirements and beyond the ESS capability shall be calibrated at the supporting Type II PMEL.

3.8.2.2 An ESS shall be assigned to provide calibration and repair support to specific Air Force organizations for weapon systems at both fixed and deployed locations.

3.8.2.3 A supporting PMEL shall be designated for each ESS at a fixed location. The nearest PMEL listed in paragraph 10.1 shall assume support of the ESS, when deployed. Interservice support shall be used, where practical, in accordance with paragraph 4.4.

3.8.3 Portable Automatic Test Equipment Calibrator (PATEC). The PATEC is used to calibrate ATE on-site. The PATEC consists of a set of portable standards designed to calibrate a specific ATE system. The PATEC standards are housed in portable cases. See paragraphs 3.8.1.3 and 3.8.1.4 for redistribution or turn-in process.

3.8.3.1 Environmental requirements are determined by the requirements of the ATE being calibrated.

3.8.3.2 Calibration of ATE using the PATEC shall be in accordance with 33K- or 33D- series T.O., as applicable.

3.8.3.3 The PATEC is normally be assigned to a designated PMEL. There are cases where the PATEC is owned by the organization owning the ATE because of mission security, geographic, or deployment considerations. When a PATEC is built to support specific ATE, the activity owning the ATE shall have priority use, even though the PATEC may be held by the PMEL. The PATEC shall be available at all times for scheduled or unscheduled calibration of the specified ATE.

3.8.3.4 Supply procedures of AFMAN 23-110 shall be followed for transfer and receipt of the equipment when the PATEC is intended to be used in the deployment mode.

3.8.4 Field Assistance Support Team for Calibration (FASTCAL). FASTCAL is a deployable PMEL with a measurement capability equivalent to a basic Type IIB PMEL plus a small 68°F room. It is comprised of NAVAlR shelters, measuring 8 ft wide and 20 ft long. These units are put together and may contain six measurement area shelters, one office shelter, one scheduling/receiving shelter, and one storage shelter plus others. The six

measurement area shelters provide calibration capability in the DC and Low Frequency, Microwave, Optical, Dimensional, and Electro Mechanical areas.

3.8.4.1 FASTCAL can be deployed using aircraft, air-ride trailers, or ships. Once deployed, FASTCAL requires a 20,000 to 25,000 pound crane or forklift to complex the units. Based on various conditions, complexing time is approximately two days.

3.8.4.2 FASTCAL is equipped with Environmental Control Units (ECUs) designed to maintain interior temperature at 73 ±6°F and relative humidity at less than 50 percent. Two of the shelters have 68°F±1°F areas.

3.8.4.3 FASTCAL has the ability to be powered by either a commercial or a mobile generator type source. Power requirements are:

a. Six individual lines having one 200 Amp breaker, 120/208 VAC, 3 phase WYE at 50/60 Hz or one 480 VAC 60 Hz or 380 VAC 50 Hz, 3 phase, 625 Amps, Delta generator.

b. A 625 Amp generator can provide mobile power.

3.8.4.4 Requests for FASTCAL support shall be processed through MAJCOM Functional Area Managers.

3.9 PMEL MANAGEMENT RESPONSIBILITIES. The PMEL shall be organized and shall operate in such a way that permanent, temporary, and mobile facilities meet the requirements of this T.O..

3.9.1 Responsibilities of PMEL Commanders and Senior Level Management. Commanders and Managers in the PMEL chain of command shall ensure that:

a. The PMEL is maintained in a condition that facilitates effective mission performance. This includes an adequate environmental system.

b. TMDE requiring calibration is not used until after it has been calibrated. Exceptions only as authorized in paragraph 3.4.9 through 3.4.14.

c. Special attention is placed on personnel proficiency, PMEL manning, environmental control, quality assurance, material resources, and use of technical directives.

d. The PMEL provides maximum support to Air Force activities, other federal agencies, contractors (authorized to receive such support), and security assistance programs under the guidelines of AFIs 25-201, 21-113, 99-101, and 65-603.

e. Controls are established to ensure that TMDE is calibrated and certified as prescribed in this T.O., AFI 21-113, and T.O. 33K-1-100-2.

f. Vehicles used to transport TMDE are equipped to provide full protection to TMDE from damage that may occur from weather, vibration, or shock.

g. When PMEL measurement standards are not maintained or authorized at an installation or on an instrumentation ship, affected TMDE shall be calibrated by the closest PMEL. Support agreements shall be negotiated between the site or base and the supporting activity. Reference DoDI 4000-19 and AFI 25-201.

h. Continuing problems with PMEL customers regarding timely delivery of TMDE for scheduled calibration shall be elevated for resolution if the supervisor responsible for the OWC quality control cannot obtain results.

i. PMEL intermediate off-equipment TMDE maintenance production requirements are identified in operations plans when applicable.

j. The PMEL shall have managerial staff with the authority and resources needed to discharge their duties.

3.9.2 Responsibilities of PMEL Managers. The PMEL Manager is the senior on-site manager responsible for the overall PMEL, quality, and production control functions. The PMEL manager shall:

a. Ensure management procedures conform to the requirements specified in this T.O., command directives and applicable contractual requirements.

b. Organize the PMEL in such a way that confidence in its independence of judgement and integrity is maintained at all times. When there is a possibility of PMEL personnel being placed under pressure by customers or other sections of the organization, reporting relationships shall be established to isolate

personnel from this pressure. The boundaries, expectations, and responsibilities of the employee in dealing with the customer may need to be specified in order to maintain independence of judgement and integrity.

c. Specify and document the responsibility, authority, and interrelation of all personnel who manage, perform or verify work affecting the quality of calibration.

d. Provide supervision by persons familiar with the calibration methods and procedures, the objective of the calibration and the assessment of the results. Management practices shall be such as to ensure adequate supervision.

e. Designate a technical manager (however named) who has the overall responsibility for the technical operations.

f. Designate a quality manager (however named) who has the overall responsibility for the quality system and its implementation. The quality manager shall have direct access to the highest level of management at which decisions are taken on PMEL policy or resources, and to the technical manager.

g. Designate alternates in case of absence of the technical or quality manager.

h. Where relevant, have documented policy and procedures to ensure the protection of customer's confidential and proprietary rights.

i. Participate in inter-PMEL comparisons and proficiency testing programs as required.

j. Establish and maintain a quality system in accordance with this T.O., and document quality policies and objectives in the PMEL quality manual in accordance with this T.O.

k. Use appropriate methods and procedures for all calibrations/verifications and related activities within its responsibility (including, but not limited to, sampling, handling, transport and storage, preparation of items, estimation of uncertainty of measurement and analysis of calibration data). TMDE shall be calibrated and certified in accordance with the requirements of this T.O., AFI 21-113, CMS T.O.s, T.O. 33K-1-100-1and T.O. 33K-1-100-2/-2MT-0.

l. Ensure documented procedures exist for the purchase, reception and storage of consumable materials used for the technical operations of the PMEL that can affect the results of calibrations.

m. Document policies and procedures for the resolution of complaints received from customers or other parties about PMEL activities. Specifically, records shall be maintained of all complaints and the actions taken to resolve those complaints. Complaints or other circumstance regarding compliance with PMEL policies, procedures, quality or the requirements of this T.O. shall be promptly resolved.

n. Submit the RCS: HAF-ILM (SA) 7808 Report and the RCS HAF-ILM (A) 9450 specified in Section 6 ensuring accurate data and on-time submission.

o. Establish a Quality Program (QP) in accordance with this T.O. and any applicable command directives.

p. Ensure all levels of management are aware of the importance of PMEL environmental conditions play in timely and accurate mission support. Locally imposed measurement restrictions and procedures shall be developed to ensure calibrations are not accomplished when environmental conditions are outside prescribed specifications. These procedures and restrictions shall be documented in a log when the facility environment deviates from prescribed tolerances. It is incumbent upon PMEL managers to be aware of PMEL environmental outages that may impact the PMEL ability to successfully support mission requirements. Should excessive outages occur, appropriate actions such as work requests to civil engineering, requests for upper level management involvement etc., shall be accomplished.

q. Ensure technicians who certify TMDE are appropriately qualified/trained.

(1) Annual calls and out of cycle requests for technical training course quotas through the Pipeline Management System (PMS).

(2) Submission of Training Quality Reports IAW AFI 36-2201.

(3) Submission of AF Form 403, Request for Special Training.

(4) Career Development Course reviews.

r. Initiate and maintain an effective safety program that includes a fire safety program per the applicable safety standards (AFI 92-302, AFOSHSTD 91-90).

s. Process items of TMDE identified as being beyond the PMEL capability to repair or calibrate in accordance with this T.O., T.O. 00-25-107 and 33-1-27, and AFMAN 23-110.

t. Minimize the use of PMEL personnel for the performance of clerical, supply, and equipment cleaning duties. Personnel trained in these skills should perform these duties.

u. Deliver and return items of TMDE that are fragile or subject to environmental damage and require support from other laboratories by courier. PMEL technicians shall not be used for courier duty unless they are to receive specialized TMDE training at the other PMEL.

v. Coordinate calibration support with medical equipment personnel in accordance with AFMAN 23-110.

w. Ensure measures are taken to ensure good housekeeping in the PMEL. Optimum cleanliness shall be maintained. No eating, drinking, smoking, or use of other tobacco products shall be permitted in the calibration and repair areas unless specifically authorized in Section 8.

x. Minimize the location of purely administrative functions within the calibration and repair area of the PMEL. Completion of the necessary forms used for certification is not considered an administrative function.

y. Establish a TMDE Coordinator training program.

z. Establish a system to control test fixtures. The system shall provide for:

(1) An identity on the test fixture that can be related to the equipment/calibration procedure for which the test fixture was fabricated.

(2) A storage area for test fixtures not permanently used in measurement setups.

(3) An index or reference file that identifies the test fixture and its storage location.

aa. Take necessary actions to minimize the late delivery of TMDE for scheduled calibration.

bb. Notify the OWC if a deficiency is discovered with the physical condition or documentation that affects the ability to calibrate or repair the item.

cc. Maintain a T.O. File on the use and operation of all relevant equipment, on the handling and preparation of items, and for calibrations/verifications. All instruction, standards, manuals and reference data relevant to the work of the PMEL shall be maintained up-to-date and readily available to the staff. Laboratories are authorized a waiver from use of standard size binders to hold 33K series T.O. (T.O. 00-5-2, paragraph 4-20). Individual 33K T.O. can be filed in individual file folders that can be color-coded to indicate the 33K series such as (K6 - Dimensional - blue). The file shall also be filed in an alphanumeric sequence. AFTO Form 57, described in Section 5, can be used in the folder to document data peculiar to each T.O..

dd. Provide priority maintenance to mission essential TMDE. This is TMDE used in direct support of systems required to meet wartime tasking.

ee. Ensure Requests for Calibration Responsibility Determination are not submitted for equipment owned and used by departments outside the Air Force. Such a customer is responsible to give the PMEL the capability to support new equipment, if the PMEL doesn't already have it.

ff. Perform initial testing on new items when the PMEL has the capability, a calibration procedure exists, or adequate commercial data or maintenance T.O. data is available to permit testing.

gg. Identify non-PMEL TMDE, identical in part number or model to PMEL standards, to any off-base organization to which they are sent for calibration. This permits the certifying technician to determine the correct calibration procedure.

hh. Maintain the security of the information in PAMS by exercising proper control of the access codes, and administer, maintain, and operate the PAMS in accordance with applicable regulations, manuals, and command instructions. Reference AFSCM 21-103

ii. When requested by the OWC prior to the local purchase of new TMDE, verify there is no available existing TMDE that can be used to satisfy the requirement, and determine if the item is already listed in T.O. 33K-1-100-2/-2MT-0.

3.10 QUALITY SYSTEM.

NOTE

The requirement of deleted Section 3A has been incorporated into paragraph 3.10.

A quality system is defined as the organizational structure, responsibilities, procedures, processes, and resources for implementing quality management. A quality system includes everything a PMEL does that affects the quality of the services provided. The elements of a PMEL's quality system shall be documented in a quality manual. The quality manual shall define and document the PMEL policies and objectives for, and commitment to, good PMEL practices and quality calibration services. The quality manual shall be issued under authority of the PMEL Manager and made available for use by all personnel.

3.10.1 QUALITY MANUAL. The purpose of the Quality Manual is twofold. First, it provides an organized way of communicating how the PMEL's quality is managed both to personnel working in the PMEL and to external parties such as base and corporate management, customers, and auditors. Second, it provides a basis for orienting new personnel on their roles and responsibilities under the PMEL quality system and how the quality system is implemented in the PMEL. The Quality Manual shall be reviewed annually by PMEL management to ensure the objectives of the quality system are being met and to introduce improvements. This review shall be documented. The quality manager shall maintain the Quality Manual in current status, and as a minimum, it shall include or reference the location of the following information:

a. Management Policy Statements. This section shall contain management's quality policy statement, including objectives for, and commitment to, good PMEL practices and quality of calibration services.

b. Organization and Management. This section shall contain a chart showing the organization and management structure of the PMEL, including its place in any parent organization and related organization charts.

c. Records. This section shall contain the procedures, responsibilities, and authorities for drafting, changing, approving, and issuing quality system documents. This includes the Quality Manual, related quality documentation such as local procedures and forms (e.g. PR, SR, and QR review forms), internal audits, management reviews, customer complaints, etc.

d. Personnel. This section shall contain a description of the responsibilities and key duties of the PMEL Manager, Technical Manager, and Quality Manager.

e. Training. This section shall identify the PMEL training requirements and methods used to obtain the required training.

f. Signatories. This section shall identify the signatures required and specific personnel authorized to sign or approve PMEL documents. Signatories shall be selected based on their qualifications to make the required decision. Signatories of calibration results shall be responsible for the adequacy of the results.

g. Accepting New Work. This section shall contain the procedures for reviewing new work, such as local procedures for completing AFTO Forms 45. This process shall ensure the PMEL has the appropriate support agreements, facilities, equipment, standards, and technical expertise necessary to support the new work.

h. Calibration Procedures. This section shall contain or reference local procedures for requesting, posting, controlling, and using calibration and maintenance procedures.

i. PMEL TMDE. This section shall outline local procedures to ensure calibration, verification, and maintenance (including preventive maintenance) of equipment owned, rented, or leased by the PMEL.

j. Quality Programs. This section shall contain local quality assurance objectives and practices. This includes specific management policies for meeting requirements of the QP. Also include the local guidance for participating in applicable AFMETCAL proficiency testing programs.

k. Recall and Notification. This section shall contain the decision process for recall of TMDE when a PMEL standard or critical customer-owned TMDE is found to be out-of-tolerance (when root cause analysis determines the out-of-tolerance condition could have affected Air Force mission systems). This element includes nonconformities discovered during QP reviews, internal audits, and management reviews.

l. Exceptions and Limitations. This section shall contain PMEL management's policy and process for permitting departures from calibration procedures, such as, permitting limited and special calibrations. Include the local process for permitting exceptions to published calibration determinations, such as, calibration interval and calibration responsibility.

m. Submitting Changes. This section shall contain local procedures for submitting changes to calibration procedures, calibration intervals, technical orders, and any other documents affecting quality of work produced. Include local procedures for completing AFTO Forms 22.

n. Measurement Uncertainty. This section shall contain the PMEL's process for determining measurement uncertainty and calibration accuracy when substituting equipment or when using a calibration authority other than 33K series procedures.

3.10.2 INTERNAL AUDITS AND REVIEWS.

3.10.2.1 Internal Audits. The PMEL shall perform annual internal audits to verify that operations continue to comply with the requirements of the quality system. A quality audit ensures that the PMEL is operating in accordance with the policies and procedures specified in the Quality Manual, this T.O. and any other contractual or directive quality documents. Persons possessing the knowledge and skills necessary to understand the process being audited as well as the process of auditing shall conduct the audit. If possible, auditors should be selected from personnel independent of the area being audited. Where the audit findings and root cause analysis conclude there is reason to doubt the correctness or validity of calibration results, the PMEL shall take immediate corrective action and initiate established recall procedures as necessary.

3.10.2.2 Management Reviews. PMEL Management shall review the quality system at least once a year to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements. The findings of each management review shall be recorded, the resulting action items assigned an estimated completion date, and the actions completed or revisited in the specified timeframe. Management reviews shall include:

a. Review of existing processes and procedures

b. Reports from managerial and supervisory personnel

c. The outcome of recent internal audits

d. Corrective and preventive actions

e. Assessments by external bodies

f. Results of inter-laboratory comparisons or proficiency tests

g. Changes in the volume and type of the work

h. Customer feedback and complaints

i. Total quality program activity

j. Training

SECTION 4

CALIBRATION ASSISTANCE AND SUPPORT AGREEMENTS

4.1 REQUESTS FOR CALIBRATION ASSISTANCE. PMEL assistance request is the identification by a PMEL of a calibration service they cannot perform and request assistance from another PMEL or AFMETCAL Det 1. PMELs lacking the capability to calibrate assigned TMDE shall perform the following after researching T.O. 33K-1-100-1, applicable CMS T.O.(s), and T.O. 33K-1-100-2/-2MT-0:

a. Request assistance from nearby Type IIB or IIC PMEL. If not available, proceed to paragraph b.

b. Request assistance from geographic supporting Type IIA PMEL (see Figure 4-1).

(1) Theater Type IIA (PACAF and USAFE) shall forward a request to the ALC Type IIA and inform the customer if they lack the capability.

(2) If the Type IIA has the capability but is temporarily out (temporarily down, etc.) it is their responsibility to seek lateral or contract support as necessary.

(3) Requests for documentation of the Type IIA PMEL assistance shall be required at the request of the servicing Type IIA PMEL. The request shall contain the following information for each item:

(a) National Stock Number

(b) Model/Part Number

(c) Manufacturer

(d) Serial Number

(e) Nomenclature/Noun

(f) Quantity

(g) Ranges/Parameters or specific points/values requiring calibration

(h) Required Accuracy

(i) The calibration procedure, or commercial data if no T.O. has been published (Data shall be returned to customer)

(j) Priority (Per paragraph 4.9)

(k) Date Required

(l) Location of Item

(m) Specific reason why item cannot be calibrated

(n) Permanent or temporary support

(4) If the IIA does not have the capability, and has never had it, then they shall forward the request to AFMETCAL Det 1.

c. Support from AFMETCAL Det 1:

(1) Providing technical assistance

(a) Identifying Air Force support locations

(b) Obtaining support from NIST or USNO when required

(c) Identifying interservice or contractual support

(2) AFMETCAL Det 1 shall advise how calibration support shall be provided and provide instructions for delivery of the equipment.

(3) No equipment shall be forwarded to AFPSL without prior coordination with the AFPSL scheduling section (DSN 366-5472/5473).

d. Unscheduled calibration support of items designated as AFPSL shall be coordinated with the AFPSL scheduling section (DSN 366-5472/5473).

e. Maintenance Support Assistance: Maintenance support assistance required by the PMEL over and above their capability shall be obtained using the instructions contained in T.O. 00-25-107.

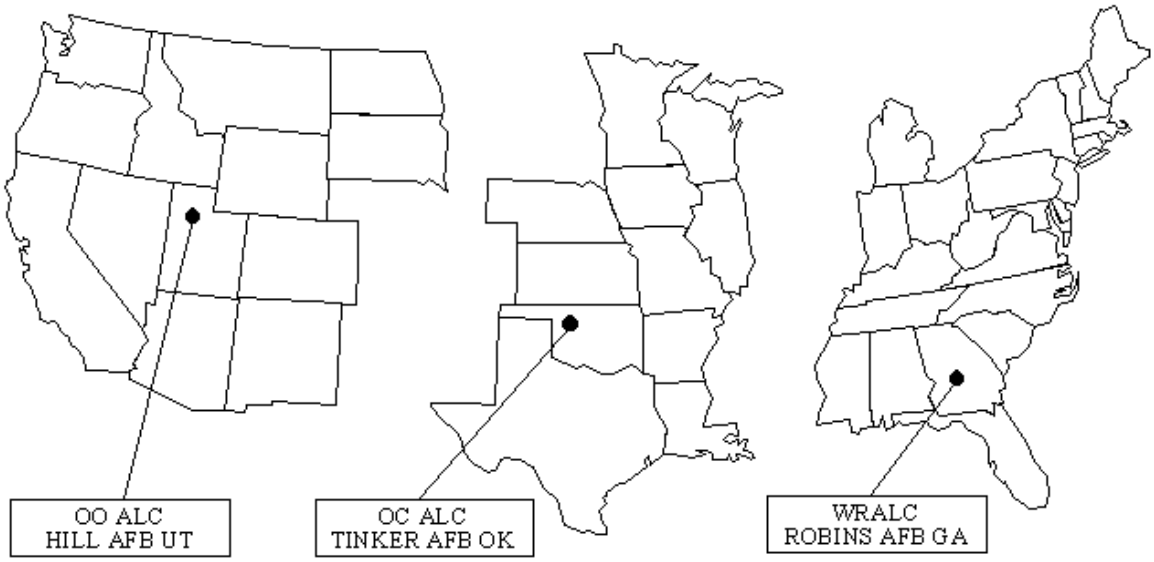

Figure 4-1.
AIR LOGISTIC TYPE IIA CONUS AREAS OF RESPONSIBILITY

* USAFE obtains support from RAF Feltwell UK, IIA PMEL
* Elmendorf AFB AK, IIA support area includes Alaska
* WR-ALC PMEL also supports USAFE including the Azores
* Western and central pacific areas obtain support from Kadena AB JA, IIA PMEL
* OO-ALC PMEL also supports Elmendorf AFB AK and Kadena AB JA

4.2 TECHNICAL/ENGINEERING ASSISTANCE. Requests for technical and/or engineering assistance on specific metrology problems that cannot be resolved by the PMEL or T.O. 00-5-1 shall be submitted to AFMETCAL Det 1. PMELs requesting assistance shall furnish a comprehensive description of each problem and advise if on-site assistance is recommended.

4.3 CALIBRATION, REPAIR & RETURN, AND LOAN. TMDE may be processed between PMELs on a repair and return; calibrate and return; or repair, calibrate, and return basis. Loan of TMDE between PMELs is authorized IAW procedures outlined in AFMAN 23-110. This maintenance concept is used when it is necessary for a PMEL to obtain maintenance assistance from an off-base PMEL. These transactions shall be coordinated between the PMELs involved. If the equipment is not to be sent to the PMEL, but to the depot or TRC, it shall be necessary to follow the procedures in T.O. 00-25-107 prior to movement of the equipment. After notification from the off-base PMEL that the required support can be given, the TMDE shall be delivered by courier or shipment. TMDE delivered and returned by courier shall not be processed through supply channels at either the supported or supporting PMELs location. Items of TMDE shipped through transportation channels shall be processed in accordance with established directives. In the event the TMDE is placed in awaiting parts status, the supporting PMEL shall notify the supported PMEL immediately and provide an estimated delivery date for parts and an anticipated completion date. If the Type IIA PMEL cannot perform the required maintenance, the procedures outlined in T.O. 33-1-27 shall apply. T.O. 00-25-115 identifies the ALC responsible for management of each stock class and for specific weapon systems/subsystems.

4.4 PMEL SUPPORT AGREEMENTS

4.4.1 Definitions

4.4.1.1 Interservice Support. Action by one military Service or element to provide logistic support to a different military service or element.

4.4.1.2 Interdepartmental/Agency Support. Provision of logistics support by the military services to departments or agencies or the United States government (other than military) with or without reimbursement.

4.4.1.3 Host-Tenant Support Agreement. An intraservice agreement recorded on an AF Form 149 between active Air Force, ANG, or AFRC units (as required).

4.4.1.4 Unique Support Equipment. Equipment required solely to support the customer's equipment shall be provided by that customer if the customer is not Air Force, ANG, or AFRC. The Air Force is not required and shall not be tasked to build up a capability at Air Force expense that is used only to support another military service or federal department.

4.4.2 Generating Agreements. Regional support requirement external to a PMELs parent unit may require a wide variety of documented agreements. The intent of this paragraph is to assist the PMEL chief in performing their task in generating an agreement if AFI 25-201 specifies a requirement or there is a need to generate an interservice agreement per DoDI 4000.19. PMEL managers require a working knowledge of support agreements and financial procedures to ensure resources are available and adequate to provide customer support. They also generate procedures to maintain communications to ensure mission support needs within a PMEL's area of responsibility are met. PMEL managers (or PMEL contract managers) shall also be made aware of when to charge customers for services rendered. AFMC Type IIA calibration laboratories typically are not required to generate Host Tenant support agreements when servicing other PMELS. Agreements that could be encountered are:

a. Host-tenant (AFI 25-201, AFI 65-601, Vol 1)

b. Interservice/Interdepartmental/Agency (DoDI 4000.19) Interservice and Intergovernmental Support.

4.4.2.1 The following policies shall apply when generating support agreements:

a. Support of other Air Force Units. Consider:

(1) Facility Requirements.

(2) Cost, Reimbursement.

(3) Manpower Authorizations Required and Source of Spaces and Funding.

(4) Effect on PMEL parent unit's Operations Plan. Consider what shall be PMELs role.

(5) Training Requirements, User and PMEL.

(6) Equipment, Parts, and Technical Data Requirements. Customers are responsible to provide any material needed to support locally purchased items.

(7) Priority of Work, Customer's FAD and Precedence Rating. [USAF Programming Directive - (PD)].

(8) Customer's Wartime Requirements and Priorities.

(9) Overdue Procedures.

(10) PMEL Assistance to Customer.

(11) Deficiency Reporting Procedures.

(12) Contract Maintenance and Calibration.

(13) Off-base Shipping and Transportation.

(14) Organizational Maintenance.

(15) Scheduling File Maintenance.

(16) Exercise or Mobility Support.

(17) Mission Changes.

(18) Unique Equipment Maintenance Cost.

(19) Support Requirements for Locally Procured TMDE.

(20) Workload.

b. Support of non-Air Force units. Agreement is required on: all items listed in 4.4.2.1.a and the following:

(1) Forms and Labels to Use.

(2) Calibration Intervals to Use.

(3) Scheduling and Management Procedures.

(4) Calibration Procedures to Use.

(5) Responsibilities.

c. Agreements can be simplified if PMELs have a base regulation established that contains policy, assigns responsibilities, directs actions, and prescribes procedures tailored to meet local needs and is referenced in the agreement. Base regulations apply to all organizations assigned or attached to the base or tenant organizations. They also apply to off-base and remote-site organizations of the same or different parent command if the subject matter relates directly to support and services furnished them by the issuing base.

NOTE

Do not submit a Request for Calibration Responsibility Determination for non-Air Force customer assets. Other agency customers are responsible for providing the calibration procedure to be used, or, the specifications and accuracies required. Do not ask AFMETCAL Det 1 to write a calibration procedure or provide special equipment. It is the customer's responsibility to provide material resources the PMEL needs to assist them unless the PMEL already has the capability.

d. Policy, information, and procedures may be prescribed in a letter or message when there isn't time to process a publication. Letters or messages have to be replaced by a formal publication as soon as possible (AFI 33-360 Vol 1).

e. Financial Administration. Information on financial matters, budgeting reimbursement, etc., is found in AFI 65-601 Vol 1 and DFAS-DER7010-1.

f. Support Agreement Assistance. Assistance for development of support agreements and resolution of problems can be obtained from:

(1) Base Level Office Primary Responsibility (OPR) for support agreement.

(2) Parent Command PMEL Functional Area Manager (AFI 21-113), or Command Support Agreement Functional Area Manager.

(3) Air Force Material Command (AFMC), AFMETCAL Det 1 is the Air Force point of contact for International Calibration Support.

(4) HQ USAF.

(a) Directorate of International Programs.

(b) International Logistics Planning and Policy.

(5) Support Agreement References.

(a) AFI 25-201, Host Tenant Support Agreements.

(b) AFI 38-201, Manpower Policies/Procedures.

(c) AFI 21-113, Air Force Metrology and Calibration Program.

(d) Federal Acquisition Regulation (FAR).

(e) DoDI 4000.19.

(f) AFI 20-103, Logistics Support of US Nongovernmental, or Non-military Agencies.

(g) DFAS-DER7070-3, Financial Management and Accounting for Security Assistance and International Programs.

(h) COMMAND 21-XX, Maintenance Management.

(i) AFI 65-603, Official Representation Funds-Guidance & Procedures.

4.4.3 Negotiation, Administration, and Review. Each military service is responsible for providing or arranging for support of its own forces. Maximum practical use of support agreements shall be made when overall economies can be realized without impairing military effectiveness.

4.4.3.1 Support agreements shall be generated only when necessary. Support agreements shall be negotiated at the lowest possible organizational level; customer to PMEL, for instance. This is with the concurrence of the base OPR for the agreement. PMEL managers shall coordinate on all agreements that include provisions of PMEL support.

4.5 COMMERCIAL CALIBRATION OF TMDE. Calibration of TMDE shall be performed by the PMEL unless AFMETCAL Det 1 has approved the commercial calibration. The following policies pertain to commercial calibration of AF TMDE.

4.5.1 Requests for Commercial Calibration Service. **AFMETCAL Det 1 is the only authority for approving commercial calibration service**. PMEL requests for commercial calibration service shall be made only after an AFTO Form 45 has been submitted to AFMETCAL Det 1 and approved. Also, no commercial calibration service request shall be submitted until requests for lateral support from other PMELs or the AFPSL have been exhausted. When authorized to contract any part of the calibration, this work shall be placed with a laboratory complying with the requirements of ANSI/NCSL Z540-1-1994. IM and program manager procuring TMDE involving commercial calibration shall submit a data call prior to contract award. See CMAL "Procedure for AFMETCAL Coordination on Request for Commercial Calibration Support" for details. The requester shall ensure and be able to provide documentation that the contractor is competent to perform the activities in question and complies with the same criteria of competence as an USAF laboratory. AFMETCAL Det 1 shall, at its discretion, determine if additional data or a site visit is required. The requester shall advise the customer of its intention to contract any part of the calibration to another party. The requester shall record and retain the details of its investigation of the competence and compliance of contractors and maintain a register of all contractors. The results will normally be reported in a calibration certificate/report (see Paragraph 5.6.3).

4.5.2 Intervals for Commercially Calibrated Items. The intervals for commercially calibrated TMDE shall be IAW any applicable CMS or T.O. 33K-1-100-2/-2MT-0. The appropriate Air Force certification label shall be affixed to the TMDE by the PMEL. The calibration interval on commercially calibrated TMDE starts the date the contractor calibrated the item. Calibration of TMDE shall be performed by the PMEL whenever possible, rather than accept commercial certification. Unless aprroved by AFMETCAL Det 1 commercial repairs performed on customer TMDE shall be verified by the PMEL when the PMEL has the capability and the responsibility to calibrate the item.

4.5.3 Contract Calibration of TMDE. The following policies pertain to items listed within CMS T.O.s and T.O. 33K-1-100-2/-2MT-0 with a calibration responsibility identified as **N49**, **N59**or **N64** requiring contract calibration.

4.5.3.1 General. AFMETCAL Det 1 has responsibility for management of all calibration services for TMDE listed as **N49, N59** or **N64**. AFMETCAL Det 1 shall fund and perform all contracting functions necessary to obtain calibration services from both the private sector as well as other DoD agencies. Fund cites will no longer be required by the field. The AFPSL shall provide PMELs and owning work centers with disposition instructions as their requests for calibration services are received. Equipment requiring calibration under Depot Maintenance Activity Group (DMAG) or Stock Funded programs shall not be serviced or funded under this process.

4.5.3.2 PMEL and Owning Work Center Relationship. It is the responsibility of the PMEL to notify the customers within the PMEL's geographic region that contract calibration management has been centralized at AFMETCAL Det 1. To obtain calibration support, they shall submit their request for calibration services directly to the appropriate workload scheduler as directed within para 4.5.3.6. The PMEL is encouraged to assist customers with process implementation and technical difficulties when ever possible. It is the responsibility of the owning work center to coordinate with the appropriate workload scheduler on all requests for calibration services.

4.5.3.3 Workload Scheduling. Schedule **N49**, **N59** and **N64** designated items as follows:

a. PMELs - Prior to shipment of TMDE from the PMEL, MDC data shall be entered into the PAMs system. This may be accomplished by utilizing action taken code "D" and disposition code "6". When calibration is complete and TMDE is returned, document MDC in PAMs utilizing action taken code "X" and disposition code "A" and update the warranty date field.

b. Owning Work Centers - Shall contact the AFPSL scheduler directly and are required to maintain their scheduling records.

4.5.3.4 Shipping and Logistics.

4.5.3.4.1 Equipment shall be shipped from the owner's location directly to the service provider location as per the disposition instructions provided by the Air Force or Army workload scheduler. Owning organizations shall not ship equipment to the PMEL unless the PMEL has given specific instructions to do so. Shipping expenses to the calibration destination shall be the responsibility of the owning organization. The appropriate calibration service provider shall be responsible for return shipping expenses. Questions or comments concerning turn-around time or contractor service should be directed to the AFPSL, Army Primary Standards Laboratory (APSL), or other Army workload scheduler. Any problems not resolved with the appropriate workload scheduler shall be directed to AFMETCAL Det 1. See AFMETCAL Det 1 Product List for POC name and phone number. To ship the item, deliver the TMDE, a completed DD Form 1149, and an appropriate reusable shipping container to the local LGTT office. The DD Form 1149 shall be completed according to AFI 24-201, attachment 6, and applicable MAJCOM Maintenance Management Instruction 21-101. Ensure instructions are enclosed in the shipment to direct the shipping destination to return signed copy of the packing slip. Mark one copy of the DD Form 1149 "ADVANCE COPY" and send (mail, FAX, e-mail, etc.) it to the calibration destination.

4.5.3.4.2 Upon return of the calibrated equipment, the owning work center shall perform an incoming acceptance inspection (conformance assessment for physical condition, safety, documentation, and cleanliness). Ensure the equipment has appropriate certification label and when required, a calibration certificate. Contact the AFPSL workload scheduler if the unit does not conform in any way or documentation is insufficient. If the TMDE is determined to be unserviceable, the owning work center shall prepare and submit SF Form 368, Product Quality Deficiency Report. If the TMDE is determined to be serviceable, then the owning work center shall complete DD Form 250, Material Inspection and receiving Report, or equivalent document. A copy of the DD Form 250 or commercial equivalent shall be forwarded to AFMETCAL Det 1 to ensure contractor payment for services performed. For N49 and N59 items, please forward to AFMETCAL Det 1/MLLW, and for N64 items, AFPSL Irving-Wick Drive West, Heath, Ohio 43056-6118.

4.5.3.5 Certification. The commercial or DoD agency source calibration label shall remain on the unit. An AF certification label shall be attached to the TMDE citing T.O. 00-20-14 in the authority block. Compute and assign date due calibration in accordance with para 4.5.2. The PMEL or owning work center shall retain contractor certificate of calibration, and warranty document on file until warranty expiration. If data contained within the certification label, calibration certificate, or certificate of traceability is incorrect, notify the appropriate workload scheduler for instructions.

4.5.3.6 Request for Contract Calibration Support. In order for the PMEL or owning work center to obtain contract calibration services for items listed within CMS T.O.s and T.O. 33K-1-100-2/-2MT-2 as N49, N59 or N64, contact the appropriate workload scheduler. See CMAL "Laboratory Procedures for AFMETCAL Contract Calibration Support" for scheduler information and instructions.

4.5.3.7 Repair. Incidental repair discovered during calibration shall be accomplished and funded by AFMETCAL Det 1. Funding shall be provided for incidental repair only. If a unit is shipped which is in need of major repair, the owning organization will be contacted by AFMETCAL Det 1 for a fund cite and/or disposition instructions. AFMETCAL Det 1 must grant approval for major repair actions.

4.6 CALIBRATION SUPPORT FOR SITE ACTIVATION TASK FORCE (SATAF), OPERATIONAL TEST AND EVALUATION (OT&E) INITIAL OPERATIONAL TEST AND EVALUATION (IOT&E).

4.6.1 General. (Reference DoDI 5000.2 AF SUP 1 and AFI 63-111.) Calibration support for activation of new sites or upgrading of operational site equipment by Air Force contractors shall be provided in accordance with host-tenant agreements established under the provisions of AFI 25-201. AFMETCAL Det 1, in coordination with the program manager and the commands involved, shall develop the necessary calibration support plans and alert the

selected PMEL of the projected workload and responsibility to support the installation and checkout contractor. The responsible PMEL shall initiate action in accordance with the plan to obtain equipment and manning to support TMDE to be utilized by the installation, checkout, and acceptance teams and during the subsequent operational phase. This support is normally limited to:

a. TMDE listed in any applicable CMS or T.O. 33K1-100-2/-2MT-0 as PMEL responsibility.

b. TMDE that is scheduled to remain on-site for use during the operational phase.

c. The PMELs existing capability.

NOTE

Equipment, which will not be used during the operational phase, shall be identified by the PMEL as equipment requiring alternate support.

4.6.2 Requests. Requests for support of contractor-owned TMDE shall normally be received from one of the following sources:

a. The administrative contracting officer.

b. The SATAF or project officer.

c. The local base procurement officer.

d. AFMETCAL Det 1 through one or more of the above.

4.6.3 Application. These provisions also apply for tests on new or improved systems at system or subsystem sites.

4.7 SECURITY ASSISTANCE (SA) PROGRAMS AND FOREIGN MILITARY SALES (FMS). FMS cases for the sale of systems to friendly nations often involve the necessity of establishing or augmenting a metrology program for that system. AFMETCAL Det 1 develops specific metrology programs providing for the repair and calibration of TMDE and follow-on calibration support. All queries for FMS cases or SA Programs shall be directed to AFMETCAL Det 1, 813 Irving-Wick Dr W, Ste 4M, Heath, OH 43056-6116.

4.8 TMDE WARRANTIES. TMDE initially issued to using activities is frequently covered by a provisional warranty from the manufacturer. These warranties vary in degree of coverage, specific service/maintenance performed, and correction of design, material, and workmanship deficiencies, which result in the item of TMDE performing below specification and contractual requirements. Detailed information on specific warranty provisions is explained in AFMAN 23-110.

4.8.1 New Equipment Receipt. Upon receipt of new equipment PMEL shall:

a. Determine warranty expiration date. Complete and mail any warranty cards.

b. Calibrate the equipment, or, if repair is required and is covered by warranty, return to owner/ user with appropriate information required to promptly send the item through Base Procurement and contracting office IAW applicable regulations.

c. After calibration, whenever reasonable and conditions permit, short cycle the next date due calibration so the item is due back in the PMEL no later than 30 days prior to warranty expiration date.

d. Consider centrally procured items with warranties that fail calibration as subjects for Product or Quality Deficiency Reports.

4.8.2 Warranty Processing. Processing of a warranty action is at the discretion of the local contracting office. If the local contracting office requires an AF Form 9, it shall be submitted. Ref AFR 67-1, Vol 2, Part 13.

4.9 INPUT PRIORITY SYSTEM. (Typically, not the internal PMEL scheduling system)

4.9.1 Priorities. Items submitted to a PMEL or the AFPSL shall use the following priority system:

a. Priority 1/Emergency - The TMDE/standard has grounded an aircraft or major weapon/communication system. There is no spare or lateral support available. The item shall have a cover letter signed by the owning work center (OWC) Logistics Group Commander or designated representative and include a request for priority return shipment. The item shall be shipped by priority means. The item shall be worked as soon as it arrives at the supporting PMEL or the AFPSL and upon the completion of any required soak time. The supporting base PMEL or AFPSL shall alert the appropriate supported PMEL scheduler with a telephone call or message of the impending return of the completed priority item.

b. Priority 2/Mission Essential - The TMDE/standard is mission critical (Direct Impact), but there are no aircraft or weapon/ communication systems grounded. There is no spare or lateral support available. The base TMDE branch chief and OWC flight chief shall determine the validity of the priority. The base TMDE flight chief shall sign a cover letter (suggest a form letter) requesting and justifying the Priority 2. Priority shipment shall be at the discretion of the base TMDE and OWC flight chiefs. The item shall be the next unit worked in the appropriate AFPSL area or PMEL. The supported base PMEL shall notify the supporting PMEL scheduler by telephone or by message of the impending arrival of the priority.

c. Priority 3/Routine - The TMDE/standard requires calibration/repair and is required for routine maintenance. This item shall be processed at the PMEL on a first in/first out basis. This is equivalent to the normal processing of equipment now in effect.

4.9.2 Shipping Documentation. The requested maintenance priority (Priority 1, 2, or 3) shall be clearly marked on the shipping document, DD Form 1149, advance and equipment copies. The responsible receiving scheduler shall contact the shipping base PMEL when a unit arrives without a cover letter but is identified as a priority 1 or 2 on the shipping document. If a cover letter has not been generated, the item shall be processed as routine. Shipping requirements for Priority 1, 2, and 3 shall be coordinated with local transportation specialists to ensure shipping delays are minimized.

SECTION 5

PREPARATION AND USE OF CALIBRATION FORMS AND LABELS

5.1 TMDE CERTIFICATION STAMP (K STAMP). The K Stamp is a PMEL technician's official signature on those forms, tags, or labels described in this T.O. and applicable command directives. It shall be used only on these forms. Using an electronic version of the K stamp is authorized. The use of K stamps by PMEL technicians is mandatory on all certification labels. The PMEL manager shall designate who will be issued stamps. Stamps shall be serially numbered to identify the technician or supervisor and the activity to which he or she is assigned. The K stamp shall be as illustrated in Figure 5.1. The use of a stamp with smaller or larger dimensions is optional, provided it is dimensionally proportional and does not exceed the space available on forms. The K stamps shall be obtained through local purchase.

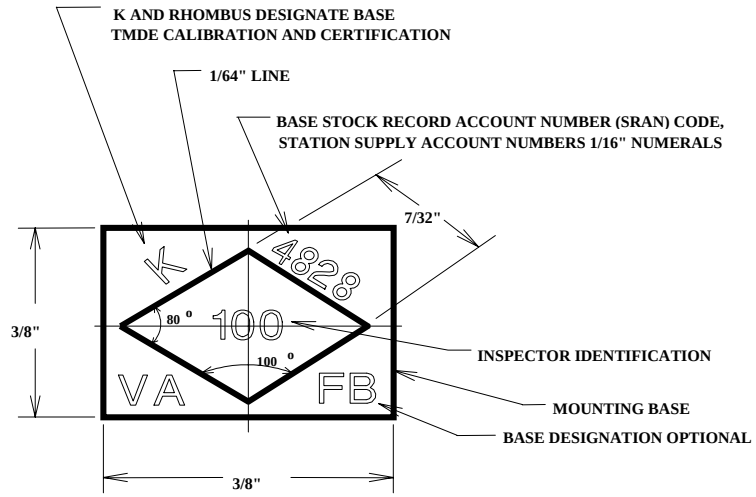

Figure 5-1.
TMDE CERTIFICATION STAMP (K STAMP)

5.2 GENERAL INSTRUCTIONS.. The forms and labels in this section are mandatory unless otherwise noted. All written entries on labels and forms shall be in non-smearing permanent black or dark blue ink. Approval to use a computer generated form or label in this section shall be obtained by AFMETCAL Det 1 IAW AFI 33-360,V2.

NOTE

Anyone having trouble with one of the following labels or forms, due to their manufacture, shall report it to AFMETCAL Det 1.

5.2.1 Affixing Labels.

5.2.1.1 Only authorized personnel shall affix labels.

5.2.1.2 When affixing labels, do not cover TMDE identification data (part or serial number, etc). Also, do not affix labels where they would prevent use of TMDE (i.e. covering controls or control markings).

5.2.1.3 Always affix Bar Code Labels and certification labels where the user will see them during normal handling and use of the TMDE. Affix labels to a clean surface on the TMDE mainframe if possible, not on removable parts or panels. In the following instances, it may not be possible to affix labels to the TMDE:

a. The TMDE is too small to affix a label or its nature will not allow affixing of a label (optical flats and gage blocks). In these cases, the label may be placed on a removable shoe tag, or if the TMDE has a container, the label may be affixed to it.

b. The TMDE is used in an environment that might damage the labels (i.e. oil or fuels could destroy labels). Labels may be affixed away from the instruments.

c. On complex TMDE such as test stands or checkout consoles, certification labels for components may be grouped on the end item.

NOTE

When a label is not affixed to its TMDE, there shall be some definite marking or annotation (preferably part number/serial number) on either the label or TMDE that links the two together. This requirement also applies to individual TMDE items that are part of a set or kit.

5.2.2 Removing Labels. Only authorized personnel shall remove labels when the item is being returned to supply. Prior to returning TMDE to supply, all labels shall be removed except the Bar Code Label. The PMEL shall be notified the item has been turned in so they can remove it from their master inventory. Document the condition tags IAW T.O. 00-20-3.

5.3 BAR CODE LABELS. The PMEL shall ensure an original bar code label, AFTO Form 65 or 66, is initially affixed to each item of Air Force TMDE in the PMEL inventory. Ensure after cleaning TMDE surfaces that they are dry before applying these labels because wet solvent will remove the adhesive. Ensure there is at least one/eighth inch on both ends of the label beyond the bar code marks; this allows the bar code scanner to properly read the label. Preferred location for the bar code labels is on the upper right corner of the front panel. Damaged labels shall be replaced by a new AFTO Form 65 or 66 or an equivalent computer generated label using the original bar code number. Equivalent bar code labels are only authorized as replacement labels.

5.3.1 AFTO Form 65 Aluminum Stock. This aluminum label, AFTO Form 65 (see Figure 5-2), is the preferred Bar Code Label due to its durability. However, there may be instances, due to safety or TMDE function, where the polyester AFTO Form 66 shall be used instead. See the instructions for the AFTO Form 66.

Figure 5-2.

AFTO FORM 65, BAR CODE LABEL, ALUMINUM STOCK

5.3.2 AFTO Form 66 Polyester Stock . Use of the polyester label, AFTO Form 66 (see Figure 5-3) is recommended, when using the aluminum AFTO Form 65 could be a safety hazard or prevent proper TMDE function or calibration.

Figure 5-3.

AFTO FORM 66, BAR CODE LABEL, POLYESTER STOCK

Examples include:

a. Small RADIAC dosimeters.

b. Small torque indicating devices.

c. TMDE that is inserted into mainframes or incorporated into other types of equipment where the label could become a conductive foreign object damage (FOD) hazard if it came loose.

d. TMDE used on a flightline or anywhere a dislodged label could be ingested into an aircraft engine.

5.4 CERTIFICATION LABELS.

5.4.1 General. All equipment that requires calibration shall have a certification label attached by the calibrating workcenter prior to use by the Owning Workcenter (OWC). The one exception to this is when a non-Air Force agency calibrated the TMDE. In this instance, the TMDE shall have both the non-AF agency's certification label and an Air Force certification label with the additional required information affixed. The authority in this situation is this T.O. Also, enter an annotation in the Air Force certification label special block, referencing the non-AF certification label and any additional certification data associated with that calibration. When a certification label is affixed to TMDE, Air Force supply system condition tags, such as DD Forms 1574, Serviceable Label - Material, are not required unless the item is being returned to supply. Other than the OWC, any changes to calibration labels shall void the certification.

5.4.2 Common Entry Instructions. The following requirements apply to all certification labels, unless otherwise indicated. For additional requirements see specific entries under the individual labels. For War Reserve Material (WRM) packages, see the specific instructions for the AFTO Form 108.

5.4.2.1 Identification Number. Enter the OWC code and the bar code number from the AFTO Form 65 or 66 of the equipment being certified. In addition, also enter WRM if the TMDE will be packed and stored as war readiness material. When the TMDE status is coded MOBILITY, you may enter MOB if you need to identify items for Mobility purposes. This block may be filled in by the TMDE user/owner if an off base PMEL calibrates the TMDE, and the customer does not use the same database as the PMEL. Owners may change the OWC code on a certification label. When this change is made, the user/owner shall notify the PMEL.

5.4.2.2 Authority. This block applies to AFTO Forms 99 and 108 only. For those items with an AFTO Form 394 or 398 the T.O. listed in the PMEL master ID listing is the authority, if included; otherwise the authority is the T.O. listed in the applicable CMS, T.O. 33K-1-100-1or T.O. 33K-1-100-2/-2MT-0.

5.4.2.2.1 Enter the calibration procedure identified in the CMS or T.O. 33K-1-100-2/-2MT-0. Also enter the Computer Program Identification Number (CPIN), if it is used to perform part of the procedure and is not listed in the calibration procedure.

5.4.2.2.2 If there is no calibration procedure identified, either enter the DoD calibration procedure, the maintenance T.O. number, or cite the commercial data that was used, or identify it as being calibrated by the manufacturer, as applicable. For See Individual Component Listing (SICL) end-items designated NEC, leave blank.

5.4.2.2.3 Enter ABSOLUTE STANDARD in this block when applicable.

5.4.2.2.4 For TMDE calibrated with the ACS I or II enter ACS () plus the 5 digit unit access code (UAC) of the item tested. (Example: ACSI-WGGYR). Also, enter the 33K-procedure number if it is used to perform any part of the calibration manually. Abbreviations are acceptable.

5.4.2.3 Special. Enter any combination of the following as necessary. If there is insufficient space on the label for all entries, recommend affixing the label to a plain manila shoe tag. The rest of the limitations shall go on the manila tag. The certification label serves as the authority for the data written on the manila tag. The manila tag shall be attached to the TMDE item. A second alternative is to enter additional data on an AFTO Form 249 or equivalent when the plain manila tag interferes with use of the instrument. In either of these cases, reference the additional data in the special block of the certification label.

5.4.2.3.1 For SICL components, use this block to denote the component is "Part of" SICL end item part number (i.e. Part of part number 12345-1). If the component is not attached to the end-item or is to be removed from the end-item after calibration, also include the end-item bar code number or serial number.

5.4.2.3.2 For SICL end items, enter "SICL end item" in this block.

5.4.2.3.3 Indicate additional calibration data in the form of one of the other certification documents listed later in this section. Specifically identify the additional data.

5.4.2.3.4 Identify why the item was fully or partially calibrated by the maintenance T.O. or commercial data, if not the authority listed in the CMS or T.O. 33K-1-100-2/-2MT-0. If this was a result of an inadequacy in the calibration procedure, submit an AFTO Form 22 to correct the calibration T.O.

5.4.2.3.5 If the TMDE is not listed in a CMS or T.O. 33K-1-100-2/-2MT-0 and was calibrated using one of the general calibration T.O.s listed in T.O. 33K-1-100-1 Section 3, enter the accuracy to which it was certified and the source data description (i.e., +/- 0.001 inch. See '*Manufacture*' catalog #29 pg 53, model 436.).

5.4.2.3.6 Make entries per para 5.4.1 if this was a contract calibration, which resulted in calibration meeting all specifications of Air Force or requirements.

5.4.2.4 Certified By. The PMEL calibration technician's K stamp or the inspection/production stamp or initials of the calibrating technician of other PWCs shall be entered in the block.

5.4.2.5 Date Calibrated. Enter the date the TMDE was calibrated. Enter date as YYYYMMDD. When authorized to use manufacturer's certification, use date on manufacturer's certificate when provided, rather than date unit was received or placed into service. For an absolute standard, enter the date the certification label is completed. For SICL end item, complete if the SICL end item has a calibration interval. If there is no SICL end item calibration, enter NEC. A post date may be entered to agree with the date that TMDE is picked up by or delivered to the customer at intervals less often than weekly. A post date may be entered to coincide with the deployment date for TMDE that is used to equip maintenance teams that are deployed to support off-base customers. A post date may be entered to coincide with the scheduled arrival date at the deployed location, not to exceed 30 days from date of calibration, for TMDE with calibration intervals of 4 months or less deploying in support of Air Expeditionary Force (AEF) deployments. The AFPSL may also post date special project TMDE for an ESS, PATEC, TFCU or FASTCAL being put together to meet a schedule or need date.

5.4.2.6 Date Due. Enter the date the equipment is due for calibration. Enter date as YYYYMMDD. For equipment coded MOBILITY enter the regular calibration due date. The equipment is overdue at the start of the following day. For example, an item due calibration on 13 June becomes overdue at 0001 hours, 14 June. Per paragraph 3.4.14 of this T.O., the date due may be extended up to one month when justified.

5.4.2.6.1 In cases where the calibration interval is based on both a specified interval and a number of operating hours, enter the date the item would be due for recalibration under the specified interval and the operation hours.

5.4.2.6.2 Enter ICO instead of a date, if applicable.

5.4.2.6.3 Leave this block blank if the TMDE will be packed or stored as WRM. Once the item is removed from the WRM package or storage, the user/owner shall annotate their TMDE inventory listing and the certification label with the new due date. User/owner shall also notify the PMEL of the new date due. The calibration due date shall be computed using the assigned calibration interval starting from the date the TMDE is removed from the WRM status.

5.4.3 AFTO FORM 108, TMDE CERTIFICATION LABEL. An AFTO Form 108 (see Figure 5-4) can only be used if all specification of the calibration authority are met. The calibrating technician or other authorized person shall fill out this label in the following manner or as described in the general instructions, as applicable.

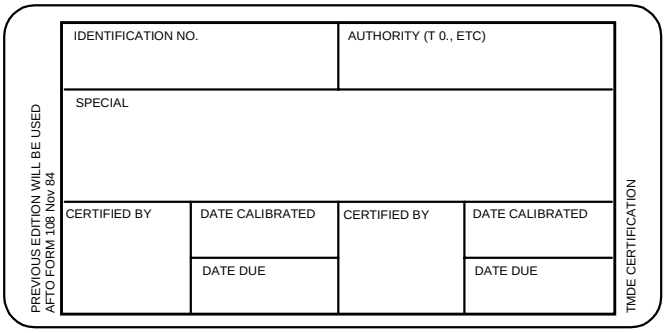

Figure 5-4.
AFTO FORM 108, TMDE CERTIFICATION LABEL (White)

5.4.3.1 Certification Labels for WRM Packages. An AFTO Form 108, TMDE Certification Label, shall be placed on the outside of containers which include TMDE packaged for storage as WRM. AFTO Forms 99/108/394/398/(as applicable) shall be used on individual items of TMDE packaged for WRM. The AFTO Form 108 blocks shall be completed as shown below.

5.4.3.1.1 Identification No. Enter the applicable weapon system with the word WRM after it (e.g., words F-15 WRM, F-16 WRM, etc).

5.4.3.1.2 Authority. Enter T.O. 00-20-14.

5.4.3.1.3 Special. (Optional use - normally left blank).

5.4.3.1.4 Certified By. Can contain the stamp of the PMEL technician. In lieu of this stamp, the MOB officer/NCO or the equipment custodian may initial this block. Certification pertains to the fact that the package contains WRM TMDE.

5.4.3.1.5 Date Calibrated. Enter the date the container is packed.

5.4.3.1.6 Date Due. Enter the date that is 18 months after the earliest DATE CALIBRATED of any equipment in the package, irrespective of the assigned calibration interval of the individual equipment. For example, two items are being packed. One was calibrated Julian day 97089 and one was calibrated 97015. The calibration due date for the entire package is calculated 18 months from 97015, the earliest date calibrated.

5.4.4 AFTO Form 394, TMDE Certification Label. AFTO Form 394 (see Figure 5-5) can only be used if all specifications of the calibration authority are met. The calibrating technician or other authorized person shall fill out this label as described in the general instructions.

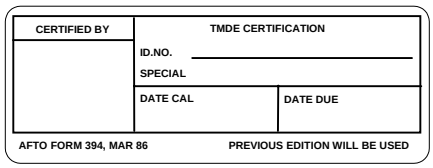

Figure 5-5.
AFTO FORM 394, TMDE CERTIFICATION LABEL

5.4.5 AFTO Form 99, Limited/Special TMDE Certification Label. The yellow AFTO Form 99 (see Figure 5-6) or the yellow AFTO Form 398 (see Figure 5-7) shall be affixed to standards and TMDE certified with a limited or special calibration as defined in Section 3 of this T.O. Also, certain 33K T.O.s may direct use of one of these labels because they do not verify all, or portions of, main functions and ranges. It is the responsibility of the user to read and apply whatever is in the SPECIAL block. These labels shall also be used for equipment designated as NHA, NPC or CBU. The calibrating technician or other authorized person shall fill out this label in the following manner and as described in the general instruction, as applicable.

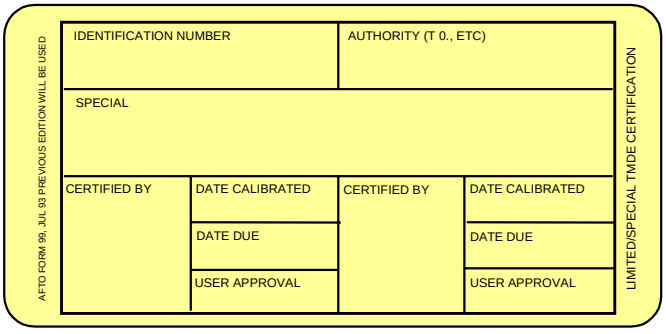

Figure 5-6.
AFTO FORM 99, LIMITED/SPECIAL TMDE CERTIFICATION LABEL (Yellow)

5.4.5.1 Special. In addition to the information listed in the General Entry Instruction in this Section, this block shall be used for the following purposes:

a. To indicate the accuracy to which the item was calibrated. If a 33K- or CMS is not available, the supporting PMEL shall compute the accuracy using the maintenance T.O. and/or the manufacturer's handbook.

b. To identify the basic function that was measured and the ranges or parameters certified; e.g., FUNCTION: 0-50 VAC. If it is more convenient, the exceptions may be entered; e.g., FUNCTION: Except 0-500V DC.

c. To identify special accuracy, ranges, points calibrated, or other information of value to user.

5.4.5.2 Date Calibrated. Enter date calibrated or NHA as applicable.

5.4.5.3 Date Due. Enter date due, NHA, NPC, or date due/CBU as applicable.

5.4.5.4 User Approval. The supervisor of the user organization or the designated representative shall sign or initial this block to indicate that the user agrees with the limited or special calibration performed by the PMEL.

5.4.6 AFTO FORM 398, LIMITED TMDE CERTIFICATION LABEL. The yellow AFTO Form 398 (see Figure 5-7) or the yellow AFTO Form 99 (see Figure 5-6) shall be affixed to standards and TMDE certified with a limited or special calibration as defined in Section 3 of this T.O. Also, certain 33K T.O.s may direct use of one of these labels because they do not verify all, or portions of, main functions and ranges. It is the responsibility of the user to read and apply whatever is in the SPECIAL block. These labels shall also be used for equipment designated as NHA, NPC and CBU. The calibrating technician or other authorized person shall fill out this label in the following manner and as described in the general instruction, as applicable.

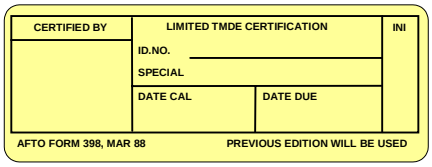

Figure 5-7.
AFTO FORM 398, LIMITED TMDE CERTIFICATION LABEL (Yellow)

5.4.6.1 Special. This block shall contain specific limitations or special calibration data. It will normally be used to direct the reader to see an AFTO Form 249 or other data sheet, since it is unlikely that all the instrument limitations (or special data) can be documented on the AFTO Form 398.

5.4.6.2 Date Due. Enter date due, NHA, NPC, date due/CBU as applicable.

5.4.6.3 INI. The supervisor of the user organization or the designated representative shall initial this block to indicate that the user agrees with the limited or special calibration performed by the PMEL. Note: On versions of this label, without an INI block, initial in the label border adjacent to the Date Due block.

5.5 AFTO FORM 256, NO CALIBRATION REQUIRED. The AFTO Form 256 (see Figure 5-8) shall be affixed to those items of TMDE listed as NCR in a CMS or T.O. 33K-1-100-2/-2MT-0.

Figure 5-8.
AFTO FORM 256 NO CALIBRATION REQUIRED LABEL

5.5.1 Annotations. Organizations that possess non-reparable NCR TMDE are responsible for affixing and validating the AFTO Form 256 for these items.

5.5.1.1 Validation. This label shall be validated with a PMEL calibrating technician's K stamp, or the inspection/ production stamp or initials of the owner or user of the TMDE

5.5.1.2 Repairable TMDE. On repairable TMDE designated PMEL or AFPSL responsibility in the CMS or T.O. 33K-1-100-2/-2MT-0, place the OWC and bar code label number on the AFTO Form 256.

5.5.2 Small TMDE. On non-repairable NCR TMDE too small to affix the label, a white dot can be used in place of the AFTO Form 256.

5.6 OTHER CERTIFICATION DOCUMENTS.

5.6.1 NIST Report of Measurement. This report is completed by NIST on all Air Force measurement standards calibrated by NIST. A copy of the report shall remain with the standard.

5.6.2 Calibration Certificates or Calibration Reports.

5.6.2.1 AFPSL Calibration Certificate or Report. The AFPSL completes this certificate or report when a formal certificate/report is required or requested for base measurement standards, Air Force measurement standards, and TMDE. When issued, the certificate or report shall contain the required information in paragraph 5.6.4.

5.6.2.2 PMEL Calibration Certificate or Report. A certificate or report completed by the PMEL when requested by a user or as directed by the calibration T.O. or other directive. When issued, the certificate or report shall contain the required information in paragraph 5.6.4.

5.6.2.3 Calibration Certificates and Reports. Each calibration certificate/report shall contain at least the following information:

a. The certificate/report shall be accurate, clear, unambiguous, and objective, in accordance with any instructions in the calibration procedure.

b. Where the certificate or report contains results of calibrations performed by other than the PMEL, these results shall be clearly identified.

c. The format of the certificate or report shall be specifically designed for each type of calibration, but the headings shall be standardized.

5.6.2.4 Amendments to the calibration certificate or report after issue shall be made in the form of a separate document including the statement, "Supplement to Calibration Report (or calibration certificate)" and shall include the identifying number of the original report or certificate. Supplements shall meet all the requirements of original reports or certificates.

5.6.2.5 The PMEL shall notify customers promptly, in writing of:

a. Any event such as the identification of defective calibration equipment, that casts doubt on the validity of results given in any calibration report, certificate, or amendment. Such notification shall quantify the magnitude of error in the calibration results.

b. Any customer's measuring and test equipment found out-of-tolerance during the calibration/verification process. Measurement data shall be reported to the customer so that appropriate action can be taken.

5.6.2.6 The PMEL staff shall follow documented procedures ensuring confidentiality is preserved where customers require transmission of calibration results by telephone, telex, facsimile, or other electronic means.

5.6.2.7 The certificate or report shall include all information necessary for the interpretation of the calibration results. When issued, the certificate or report shall contain, as a minimum:

a. Title, e.g. "Calibration Report" or "Calibration Certificate."

b. Name and address of PMEL, and location where calibration was performed, if different from the PMEL.

c. Unique identification of the report (such as serial number) and of each page, and the total number of pages.

d. Name and address of customer, where appropriate.

e. Description of the item calibrated, including model and serial number.

f. Condition of the calibration item.

g. Date(s) calibrated. (YYYYMMDD)

h. Identification of the calibration procedure used or a clear description of any nonstandard method used.

i. Reference to sampling procedure, where relevant.

j. Any deviation from, additions to, or exclusions from the calibration method, and any other information relevant to a specific calibration, such as environmental conditions.

k. Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs, as appropriate, and any failures identified.

l. A statement of estimated uncertainty of the calibration result. This requirement applies to the AFPSL and field PMELs where the customer can provide written proof of their requirement for this data. PMELs with a documented requirement shall contact AFMETCAL Det 1 for assistance.

m. A signature, title, or an equivalent identification of the person(s) accepting responsibility for the content of the certificate or report (however produced), and the date of issue.

n. Where relevant, a statement that the results relate only to the items calibrated.

o. A statement that the certificate or report shall not be reproduced except in full, without the written approval of the PMEL.

p. Special limitations of use (e.g. Interpolation of data IS/IS NOT authorized).

TMDE CALIBRATION DATA

1. NOMENCLATURE	2. MODEL	3. SERIAL NUMBER
4. CALIBRATED BY	5. ENVIRONMENTAL DATA	6. CALIBRATION PROCEDURE / 7. DATE

CALIBRATION FUNCTION	ACCURACY	STANDARD READING	TEST INSTRUMENT READING	ERROR

AFTO FORM 249, JAN 96 (EF-V1) (PerFORM PRO) PREVIOUS EDITION IS OBSOLETE

Figure 5-9.
AFTO FORM 249, TMDE CALIBRATION DATA

5.6.3 AFTO Form 249, TMDE Calibration Data. The AFTO Form 249 (see Figure 5-9) may be completed for TMDE certified at other than the full range, or if necessary, to show the actual values of the parameters certified. The PMEL or other calibrating workcenter may retain a duplicate copy for records. The form shall be used only in conjunction with Air Force certification labels. The AFTO Form 249 shall be completed in the following manner:

5.6.3.1 Block 1, Nomenclature. Enter the nomenclature of the item.

5.6.3.2 Block 2, Model. Enter the type and/or model designation of the equipment.

5.6.3.3 Block 3, Serial Number. Enter the serial number of the item.

5.6.3.4 Block 4, Calibrated By. Enter either the name or the K stamp of the technician completing the calibration.

5.6.3.5 Block 5, Environmental Data. Enter N/A except in those cases when a specific environment condition is specified in the T.O. In that case, enter the specified condition, such as 25°C.

5.6.3.6 Block 6, Calibration Procedure. Enter the technical data reference containing the calibration procedures used.

5.6.3.7 Block 7, Date. Enter the date the item was calibrated. (YYYYMMDD)

5.6.3.8 Calibration Function. Enter the specific range, function, or calibration point of the instrument being calibrated.

5.6.3.9 Accuracy. Can be used to identify the accuracy of the reading.

5.6.3.10 Standard Reading. Enter the reading obtained from the standard.

5.6.3.11 Test Instrument Reading. Enter the reading obtained from the instrument being calibrated.

5.6.3.12 Error. Calculate the difference between the standard reading and the test instrument reading, using the plus sign (+) or minus sign (-) to indicate high or low test instrument readings respectively.

5.6.4 AFTO Form 250, TMDE Calibration Correction Chart. The AFTO Form 250 (see Figure 5-10) shall be completed when requested by the using organization or to show the correction that must be applied to the indicated reading to obtain the actual value. It shall be used only in conjunction with an Air Force certification label. The form shall accompany the item whenever possible. The AFTO Form 250 shall be completed in the following manner:

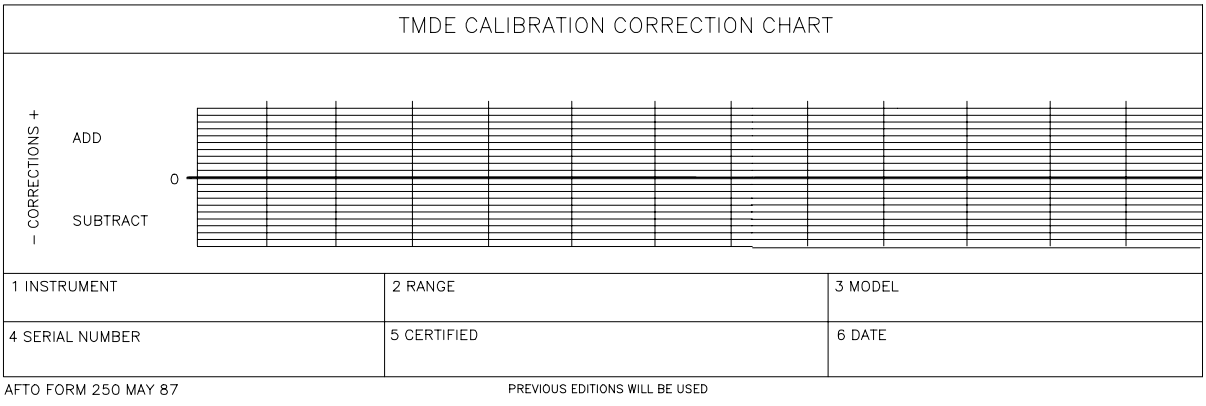

Figure 5-10.
AFTO FORM 250, TMDE CALIBRATION CORRECTION CHART

5.6.4.1 Block 1 Instrument. Enter the nomenclature of the affected item.

5.6.4.2 Block 2, Range. Enter the range in which the function is be measured. Indicate the cardinal points of the range to be certified in equal segments along the horizontal axis of the graph.

5.6.4.3 Block 3, Model. Enter the type and/or model designation of the item.

5.6.4.4 Block 4, Serial Number. Enter the serial number and the Bar Code Number of the item.

5.6.4.5 Block 5, Certified. Enter the name or K stamp of the technician completing the calibration.

5.6.4.6 Block 6, Date. Enter the date the item was calibrated. (YYYYMMDD)

5.6.4.7 Corrections. Under ADD and SUBTRACT, enter the rating or tolerance expressed in a specific value of the range being calibrated. Use the horizontal center line (0) to correspond to the settings of the calibrating standard. At each cardinal point previously entered on the horizontal axis, indicate the test instrument readings at points above or below the centerline, as required. This shall show the exact value to be added or subtracted to make test instrument readings equal to those of the calibrating standard. Connect the indicating points along the horizontal axis to complete the correction curve.

5.7 IDENTIFICATION OF MEASUREMENT STANDARDS. Equipment that is certified as an Air Force measurement standard or an Air Force base measurement standard shall be identified with the appropriate decal established for this purpose. T.O. 33K-1-101 identifies base measurement standards.

5.7.1 Gold Decal. The gold Air Force measurement standard decal and a certification label shall be affixed to standards possessed and used by the AFPSL as a basic measurement standard for the Air Force.

5.7.2 Blue Decal. A certification label and a blue Air Force base measurement standard decal shall be affixed to standards that are possessed and used by a PMEL as a base measurement standard. PMEL personnel that certify or possess the standard shall affix the decal. The base measurement standard decal shall not be affixed to working standards calibrated by the possessing PMEL. The blue decals may be obtained from the AFPSL.

5.8 AFTO FORM 255, NOTICE CERTIFICATION VOID WHEN SEAL IS BROKEN. The AFTO Form 255 (see Figure 5-11) label or an alternate method listed below shall be applied to operator accessible controls or adjustments on standards and other TMDE, which if moved, will invalidate the calibration. If label is broken or shows signs of tampering, the certification is void. Equipment shall be scheduled for certification unless situations addressed in exceptions paragraph apply. This label shall be validated with a K stamp of PMEL technician. Any non-PMEL organization applying the label can use inspection or production stamp or the initials of the responsible certifying technician. Do not cover the face of this label with any kind of tape that would defeat the purpose of the label. Alternate methods, such as sealant, may be used at the option of the responsible calibrating work center to seal TMDE if the AFTO Form 255 cannot be applied satisfactorily.

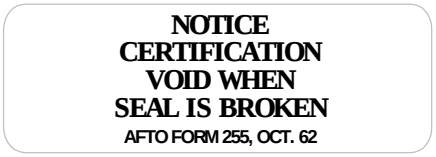

Figure 5-11.
AFTO FORM 255, NOTICE CERTIFICATION VOID WHEN SEAL IS BROKEN LABEL

5.8.1 Exceptions If the seal is broken accidentally, or to perform organizational maintenance such as cleaning or replacing fuses, pilot lights, batteries, or other minor hardware items, an identification tag such as an AFTO Form 350 shall be attached noting the reason, date, and OWC supervisor's signature. Recertification shall not be accomplished if calibration accuracy is not in question.

REQUEST FOR CALIBRATION RESPONSIBILITY DETERMINATION | *OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 6 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, DIOR, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302; and to OMB, Paperwork Reduction Project (0704-0188), Washington DC 20503. Please DO NOT RETURN your form to either of these addresses. Send your completed form to AFMETCAL, DET 1/MLLW, 813 Irving Wick Dr W, Ste 4M, Heath Ohio 43056-6116.

MODEL/PART NUMBER/TYPE	NATIONAL STOCK NUMBER	NOMENCLATURE	DATE

SERIAL NUMBER	MANUFACTURER	QUANTITY	WEAPON SYS(s) OR END ITEM	APPLICABLE MAINTENANCE T.O. NUMBER

LOCAL PURCHASE	WORK STOPPAGE	AVAILABILITY OF ITEM
☐ YES ☐ NO	☐ YES ☐ NO	☐ ON HAND PROJECTED NEED DATE ☐ MO ☐ YR

ADDRESS OF SUPPORTING PMEL/PHONE	ADDRESS OF TMDE USER/PHONE

NAME AND PHONE OF REQUESTING INDIVIDUAL	COMMAND SYMBOL

REMARKS

MAIL TO: AFMETCAL, DET 1/MLLW, 813 Irving-Wick Dr, West, Ste 4M, Heath Ohio 43056-6116 | ML CONTROL NUMBER

AFMETCAL DET 1/ML RESPONSIBILITY DETERMINATION

ML _____	DATE RECEIVED	NAME OF TECHNICAL POC, PHONE (DSN)

RESPONSE DATE	RESPONSIBILITY DETERMINATION
	☐ IS _____ ☐ CANNOT BE MADE DUE TO INSUFFICIENT TECHNICAL INFORMATION. A DETERMINATION WILL BE MADE IF YOU SUBMIT THE NEEDED INFORMATION.

REMARKS

USE EXISTING CALIBRATION PROCEDURE	COMMERCIAL DATA SUBMITTED	☐ TYPE IV LAB SUPPORT REQ
☐ YES ☐ NO	☐ YES ☐ NO	

IS NEW PROCEDURE REQUIRED	MAINTENANCE TO NUMBER
☐ YES ☐ NO	

ITEM ☐ WILL BE ☐ WILL NOT BE ☐ ALREADY IS ☐ LISTED IN T.O. 33K-1-100 ☐ LISTED IN A CMS

WUC IS	CALIBRATION INTERVAL IS	SUPERVISOR

☐ ITEM IS NOT TMDE ACCORDING TO DEFINITION IN TO 00-20-14 AND IS NOT PMEL RESPONSIBILITY

AFTO FORM 45, NOV 97 (EF - V1) *(PerFORM PRO)* PREVIOUS EDITION IS OBSOLETE

Figure 5-12

AFTO FORM 45, REQUEST FOR CALIBRATION RESPONSIBILITY DETERMINATION

5.9 AFTO FORM 45, REQUEST FOR CALIBRATION RESPONSIBILITY DETERMINATION .

NOTE

Ensure Requests for Calibration Responsibility Determination, AFTO Form 45 (see Figure 5-12), are **not** submitted for equipment owned and used by departments outside the Air Force. Such a customer is responsible to give the PMEL the capability to support new equipment, if the PMEL does not already have it.

The PMEL, with the assistance of the user/owner of new TMDE, shall initiate the Request for Calibration Responsibility Determination, AFTO Form 45 (see Figure 5-12), to ensure that the AFMETCAL Program can support the particular item of TMDE. This information is required to enable the PMELs, AFMETCAL Det 1, and the inventory managers to obtain support equipment and write any calibration procedures for calibration and maintenance of the item. If inadequate data are submitted with the form and determination of responsibility cannot be made, the request shall be returned. Many TMDE items also have accessories that require calibration. When submitting requests for calibration determinations, include data on any accessories that require calibration so they can be included in the calibration procedure. The initiating PMEL shall complete the top portion of the form and forward the form to AFMETCAL Det 1/MLLW. The PMEL retains a copy. AFMETCAL Det 1 shall complete the form, retain one copy, and return a copy to the PMEL.

5.9.1 Request Portion. The request portion of the form shall be completed by the PMEL, with the assistance of the user/owner, in the following manner:

5.9.1.1 Model/Part Number/Type. Enter the manufacturer's model designation, part number, or similar data. Provide all data available.

5.9.1.2 National Stock No. Enter the national stock number of the item. If not available, enter date stock number was requested.

5.9.1.3 Nomenclature. Enter nomenclature of item.

5.9.1.4 Date. Enter the date of the request.

5.9.1.5 Serial Number. Enter the serial number of the item.

5.9.1.6 Manufacturer. Enter the name of the manufacturer of the item.

5.9.1.7 Quantity. Enter the quantity to be supported by the PMEL, if known.

5.9.1.8 Weapon System or End Item. Identify the system or end item being supported.

5.9.1.9 Applicable Maintenance T.O. No. Identify the maintenance T.O. that applies to the unit.

5.9.1.10 Local Purchase. Check the applicable block for items purchased locally. The owner is responsible for providing the PMEL any items required for maintenance and calibration of any unit locally purchased. Before buying any items locally, the potential owner shall contact the PMEL to determine if PMEL support will require any additional equipment, supplies, or data.

5.9.1.11 Work Stoppage. Check the applicable block.

5.9.1.12 Availability of Item. If the item is on hand in the PMEL or is available on call, check this block. Use the Projected Need Date to inform AFMETCAL Det 1 when the calibration procedure shall be needed.

5.9.1.13 Projected Need Note. Enter the month and year as applicable.

5.9.1.14 Address of Supporting PMEL/Phone. Enter the address of the PMEL that shall support the item as well as their telephone number.

5.9.1.15 Address of TMDE User/Phone. Enter the OWC Code and telephone number of the user of the item.

5.9.1.16 Name and Phone of Requesting Individual. Enter name and Defense Switched Network (DSN) or Commercial telephone number of PMEL point of contact in case further data is necessary.

5.9.1.17 Command Symbol. Enter command and organization of customer.

5.9.1.18 Remarks. One type of comment to include here is a calibration responsibility determination that the PMEL or user would recommend and why it is recommended. It is requested that all reasons for the recommendations be

specified since the PMEL is in a better position to know who can best support the item. Remarks regarding the actual measurement to be made, the owning organization, its capability to support the item, and what system the equipment is to be used on. It can also be used for other comments the PMEL thinks may help the evaluator in their determination. Include applicable work unit code(s) (WUC) whenever they exist for that part number.

5.9.1.19 Commercial Data Submitted. Check the appropriate block. Identify specific items of commercial data submitted along with this form in the Remarks block. AFMETCAL Det 1/MLLW needs all available data to make the responsibility determination. It is also needed to write an adequate calibration procedure if the request results in a determination that the PMEL is responsible for calibration and repair of the item. If enough data is not submitted, a calibration responsibility determination cannot be made and the request shall be returned without a final determination. AFMETCAL Det 1 shall ensure that all data are returned to the PMEL/user as soon as possible.

NOTE

AFTO Forms 45 sent to AFMETCAL Det 1 without supporting commercial data shall be returned to the originator without action.

5.9.1.20 Mail to. The mailing address is AFMETCAL Det 1/MLLW, 813 Irving-Wick Dr W, Ste 4M, Heath, OH 43056-6116.

NOTE

This portion of the form listed above is data to be completed by the PMEL and the PMEL customer (owner of the new item) in coordination (see AFMAN 23-110). It is very important that the PMEL and the PMEL customer collaborate on this response because without an input recommendation, you essentially leave the determination of calibration responsibility to AFMETCAL Det 1.

5.9.2 AFMETCAL Det 1 Portion. AFMETCAL Det 1 personnel shall complete the following entries.

5.9.2.1 ML CONTROL NUMBER. Enter the applicable control number here

5.9.2.2 ML. Enter the organizational symbol for the AFMETCAL Det 1 office that shall serve as OPR for this request.

5.9.2.3 Date Received. The office identified above received date from.

5.9.2.4 Name of Technical POC, Phone (DSN). Typed or printed name and full DSN or commercial telephone numbers of the person that shall be OPR for this request.

5.9.2.5 Response Date. Enter the date the calibration responsibility determination is made.

5.9.2.6 Responsibility Determination. Check the appropriate block or fill in the responsibility determination.

5.9.2.7 Remarks. This block is used to explain rationale behind the entry in one of previous two blocks. Give specific reasons why a determination cannot be made or explain why a specific determination was made.

5.9.2.8 Use Existing Calibration Procedure. Check the appropriate block if the item has been designated as the PMELs' responsibility to calibrate, and an existing calibration procedure can be used to perform the calibration.

5.9.2.9 Type IV Lab Support Req. Check this block if the item is to be supported in a Type IV PMEL.

5.9.2.10 Is New Procedure Required? Yes () No (). Check the appropriate block.

5.9.2.11 Maintenance T.O. Number. Enter one, if one exists. It may provide useful data.

5.9.2.12 Item shall () shall not () be listed in T.O. 33K-1-100. () Already is listed in T.O. 33K-1-100 () Listed in a CMS. Check appropriate block.

5.9.2.13 WUC is. Enter the work unit code assigned to this item.

5.9.2.14 Calibration Interval is. Enter the initial calibration interval for this part number or model.

5.9.2.15 Supervisor. Written name of supervisor of person called out above.

5.9.2.16 () Item is not TMDE according to definition in T.O. 00-20-14 and is not PMEL responsibility. If this block is checked, the item under consideration is not the responsibility of the PMEL for either calibration or repair.

PMEL TECHNICAL ORDER INFORMATION

1. MAINTENANCE TECHNICAL ORDER INFORMATION

A. PART NUMBER	B. MAINTENANCE TECHNICAL ORDER	A. PART NUMBER	B. MAINTENANCE TECHNICAL ORDER

2. ADDITIONAL ITEMS REQUIRED FROM THE OWNING WORK CENTER

3. LOCATION OF TEST FIXTURES	4. SUITABLE SUBSTITUTES FOR STANDARDS REQUIRED IN CALIBRATION PROCEDURES	
	A. TMDE CALLED FOR	B. SUBSTITUTE ITEM
5. AFTO FORM 22 INFORMATION		

6. ALTERNATE PROCEDURE INFORMATION	7. PECULIARITIES OF TMDE OR CALIBRATION PROCEDURE

8. HIGH FAILURE COMPONENTS

A. PART NUMBER	B. NOMENCLATURE	C. NATIONAL STOCK NUMBER

AFTO FORM 57, MAR 96 (EF-V1) (PerFORM PRO)

Figure 5-13.
AFTO FORM 57, PMEL TECHNICAL ORDER INFORMATION

5.10 AFTO FORM 57, PMEL TECHNICAL ORDER INFORMATION. The AFTO Form 57 (see Figure 5-13) is for the PMEL to record data relative to a calibration procedure that pertains to their peculiar situation. It shall be filed in the folder holding the pertinent calibration T.O. This form is not required with each T.O. It is to be completed to the degree (and when) PMEL personnel feel is necessary or as needed. Also, it shall not be used in place of AFTO Form 22 action. Local reproduction of this form is authorized. The following guidance is provided for entries on this form.

NOTE

The technician shall verify information in this form before use.

5.10.1 Block 1, Maintenance T.O. Information. Enter the part number and maintenance T.O. for the different models or part numbers covered by the procedure in the appropriate blocks.

5.10.2 Block 2, Additional Items required from the OWC. Enter any additional ancillary items or equipment that must be supplied by the OWC to facilitate repair or calibration of the TMDE entered in Block 1.

5.10.3 Block 3, Location of Test Fixtures. Enter the PMEL storage location of test fixtures required for repair or calibration of the TMDE entered in Block 1.

5.10.4 Block 4, Suitable Substitutes for Standards Required in Calibration Procedures. Enter the part number of all TMDE listed in the procedure that is not locally available and the part number of the substitute standard in the appropriate blocks.

NOTE

Ensure required accuracy ratios are maintained when substituting standards during calibration.

5.10.5 Block 5, AFTO Form 22 Information. Enter all AFTO Form 22 information as necessary to identify deficiencies in the procedure. Enter date submitted, paragraph affected, and name of technician submitting the FTO Form 22 as a minimum.

NOTE

Approval of an AFTO Form 22 is not justification to deviate from published technical data IAW T.O. 00-5-1.

5.10.6 Block 6, Alternate Procedure Information. Enter any information that shall allow the technician to locate or perform approved alternate procedures.

5.10.7 Block 7, Peculiarities of TMDE or CAL Procedure. Enter any information that will assist the technician during calibration of the TMDE.

5.10.8 Block 8, High Failure Components. Enter any components that are considered high failure items or components that are difficult to identify (Part Number and NSN) in the appropriate blocks.

5.10.9 Continuation Sheets. Continuation sheets can be attached as necessary.

5.11 AF FORM 537, PMEL SHIPPING LABEL.

The AF Form 357 (not pictured) shall be used as prescribed when TMDE is shipped from one PMEL to another for calibration/repair and return.

SECTION 6

PMEL REPORTS: RCS HAF-ILM (SA) 7808 and RCS HAF-ILM (A) 9450

6.1 PMEL REPORT RCS. HAF-ILM (SA) 7808, PMEL REPORT. This report has been established to provide information to AFMETCAL Det 1 and USAF/ILMM to aid in the management of the AFMETCAL Program and to perform special studies. The major commands use the report for the management of their respective PMEL programs. AFMETCAL Det 1 uses this information to produce a semi-annual Data Summary PMEL Report. The 7808 report is also used to generate a self-sufficiency listing for each PMEL and provides a detailed listing of the items that each PMEL cannot do themselves.

6.1.1 Date Report to be completed. The report shall be completed as of 30 June and 31 December each year at those Air Force activities operating authorized PMELs listed in paragraphs 10.1 through 10.4.

6.1.2 Date Report to be submitted. The report shall be submitted to AFMETCAL Det 1 to arrive by the 31st day of July and January. The report shall be accomplished using the AFTO Form 80, (Figure 6-1) or the PAMS generated form when that program is implemented. The report may be submitted on plain bond paper for contractor operated PMELs. Local reproduction is authorized. Locally reproduce AFTO Form 80 on 8 1/2 X 11 paper as shown in Figure 6-1.

6.1.3 No Classified Information. The report shall not contain classified information. When it is necessary to submit classified information, it shall be submitted by separate correspondence and cross-referenced to the applicable section of the AFTO Form 80.

6.1.4 Preparation of AFTO Form 80. The AFTO Form 80 shall be prepared in the following manner.

6.1.4.1 As of Date. Enter 30 June or 31 December as applicable.

6.1.4.2 To.

a. For the original and one copy, enter AFMETCAL Det 1, 813 Irving-Wick Dr W, Ste 4M, Heath, Ohio 43056-6116.

b. For other copies, enter addresses as directed by the major command. Ensure that one copy is forwarded to the PMEL Functional Area Manager for your command.

6.1.5 SECTION I, WORKING ACTIVITY.

6.1.5.1 Block 1, Major & Intermediate Command. Enter the major command and numbered Air Force (or comparable command) designation having jurisdiction over the PMEL.

6.1.5.2 Block 2 Base. Enter the name of the Air Force base or Air Force station on which the PMEL is located. If the PMEL is not located at an Air Force base or station, the physical location of the PMEL shall be entered.

6.1.5.3 Block 3, Unit. Enter the Air Force designation of the organization operating the PMEL. This, combined with the block 4, ORGN SYMBOL, entry is the official mailing address for correspondence with the PMEL.

6.1.5.4 Block 4, Org Symbol. Enter the administrative office symbol assigned to the PMEL for mailing purposes. Also enter the PWC code(s) for the PMEL. If the OWC is different from the PWC, enter it/them.

6.1.5.5 Block 5, Defense Switched Network No. Enter the base telephone number in the DSN system. Include extension if applicable.

6.1.5.6 Block 6, Commercial Telephone No. Enter the base telephone number in the commercial telephone system to include area/country code, as applicable.

6.1.5.7 Block 7, Ext. Enter the extension(s) at which the PMEL superintendent can be reached.

6.1.5.8 Block 8, PMEL Bldg. No. Enter the building number in which the PMEL is located.

6.1.5.9 Block 9, Date of Last PMEL Evaluation. Enter the date of the last formal evaluation visit performed by AFMETCAL Det 1 under the provisions of Section 7 of this T.O.

6.1.5.10 Block 10, Certificate Date. Enter the date of the certificate. If no certificate has been issued, enter No Certificate.

6.1.5.11 Block 11, PMEL Superintendent Name & Rank. Enter the TYPED name and military grade, when applicable, of the person directly responsible for the PMEL operations.

6.1.5.12 Block 12, PMEL Superintendent's Signature. The PMEL Superintendent shall sign in this block.

6.1.6 SECTION II, WORKLOAD.

6.1.6.1 Block 13, TMDE Inventory Supported For. Enter the number of items of TMDE the reporting activity is required to support in the categories shown. This shall not include TMDE that has never been in or supported by the PMEL. This shall be the items listed in the inventory of the PMEL. This shall include TMDE designated as NCR (no calibration required) for which the PMEL has only repair responsibilities. Exclude items sent to the depot or some other PMEL. For the purposes of this report, the categories are defined as follows:

a. AF. Activities of the Air Force and Air Force Reserve units on active duty. Government furnished equipment (GFE) used in contracted PMELs shall be included in this category.

b. ANG. Organizations of the Air National Guard.

c. AFRC. Air Force Reserve units not on active duty.

d. Army. Army and Army National Guard Organizations.

e. Navy and Marine. Navy and Marine Corp organizations and reserve units.

f. CG. Coast Guard organizations and stations.

g. CONTR. TMDE supported for contractors with a DOD contractual obligation. This does not include GFE in the contractor operated PMELs. This includes both government furnished and contractor's equipment when the contractor is a PMEL customer.

h. Other. ALL TMDE supported for activities or organizations not included in the foregoing categories. For example: DOD, NASA, FAA, and Security Assistance Program participating countries.

6.1.6.2 Block 14, Total. Enter the total number of items entered in the Block 13 categories.

PRECISION MEASUREMENT EQUIPMENT LABORATORY REPORT

OMB No. 0704-0188

REPORTS CONTROL SYMBOL RCS:

Public reporting burden for this collection of information is estimated to average 6 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, DIOR, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302; and to OMB, Paperwork Reduction Project (0704-0188), Washington DC 20503. Please DO NOT RETURN your form to either of these addresses. Send your completed form to AFMETCAL, DET 1/MLSP, 813 Irving Wick Dr W, Ste 4M, Heath Ohio 43056-6116.

TO	AS OF DATE

I. WORKING ACTIVITY

1. MAJOR AND INTER COMMAND	2. BASE	3. UNIT	4. ORGANIZATION SYMBOL
5. DSN	**6. COMMERCIAL PHONE**	**7. EXTENSION**	**8. PMEL BUILDING NUMBER**

9. DATE OF LAST PMEL EVALUATION	10. CERTIFICATION DATE
11. PMEL SUPERINTENDENT'S NAME AND RANK (*Typed*)	12. PMEL SUPERINTENDENT'S SIGNATURE

II. WORKLOAD

13. TMDE INVENTORY SUPPORTED FOR

AF	ANG	AFRES	ARMY	NAVY	COAST GUARD	CONTR	OTHER	14. TOTAL

15. TMDE INVENTORY ANALYSIS

SCHEDULED		UNSCHEDULED					
PMEL	DEPOT	NCR	NPCR	CBU	STORAGE	OTHER	TOTAL

16. WORKLOAD ANALYSIS ACTION TAKEN (*Past six months*)

ACTION TAKEN	F	G	J	K	OTHER	TOTAL

17. ACTIVITIES SUPPORTED			QUANTITY SUPPORTED					
UNIT DESIGNATION	MAJCOM AGENCY	LOCATION	PMEL	DEPOT	TFCU	ONSITE	MOB	WRM
PMEL OWNED								

III. PERSONNEL

18. MILITARY				19. CIVILIAN			
CAFSC	UDL AUTH	PMEL ASGD	ASGD FROM MAINT	SERIES AND GRADE	UDL AUTH	PMEL ASGD	ASGD FROM MAINT
2P001							
2P091							
2P071							
2P051							
2P031							
OTHER							
TOTAL							

20. NUMBER ASSIGNED PERFORMING DIRECT LABOR (*Technicians*)

IV. FACILITIES

SPACE AVAILABLE (*Sq Ft*)
TOTAL PMEL (*Gross Space*)
CALIBRATION/REPAIR AREA
OFFICE AREA
RECEIVING/ISSUE/STORAGE AREA
TRAINING/TECH LIB/BREAK AREA
CLEANING ROOM
OTHER

V. SELF SUFFICIENCY

ATTACH A LIST OF ITEMS SENT TO SOME OTHER AGENCY FOR CALIBRATION

AFTO FORM 80, JAN 97 (*EF-V1*) (*PerFORM PRO*) PREVIOUS EDITION IS OBSOLETE

Figure 6-1.
AFTO FORM 80, PRECISION MEASUREMENT LABORATORY REPORT

6.1.6.3 Block 15, TMDE Inventory Analysis. Enter the total number of items in categories shown as extracted from Master ID listing.

6.1.6.4 Block 16, Workload Analysis Action Taken (past six months). Enter, for the six-month period covered by the report, the number of completed actions recorded under action taken codes F, G, J, K, and other and the total completed actions for all action taken codes. Do not include actions taken with zero (0) unit count. Refer to T.O. 33K-1-100-1, Section 2, for in-depth definitions of action taken codes.

6.1.6.4.1 Code F. Repair. Use this code when repair and calibration is required.

6.1.6.4.2 Code G. Repair and/or replacement of minor parts. Use this code when calibration is not required as a result of minor repair.

6.1.6.4.3 Code J. Calibrated - No major adjustment required. Item is calibrated and found serviceable without need for adjustment, or is found to be in tolerance but is adjusted merely to peak or maximize the reading, or the item is in tolerance but the adjustment is required in the procedure.

6.1.6.4.4 Code K. Calibrated - Adjustment required. Use this code when adjustment(s) were required to return TMDE parameters to T.O. specifications.

6.1.6.4.5 Other. The total of all other actions (codes A, B, C, D, X, 0 through 9, and so forth).

6.1.6.4.6 Total. The total of all actions listed above.

6.1.6.5 Block 17, Activities Supported, Quantity Supported. Provide a complete list of customers supported. The first line shall contain quantities owned by the PMEL. Use a continuation sheet, if necessary.

6.1.6.5.1 Unit Designation. Enter the official military designation of the Air Force activity supported; e.g., 301 FW, 2048 COMM, etc. Identify non-Air Force activities supported by the name and organization designation shown on the interservice support agreement (ISA) or other official designation if an ISA has not been negotiated; e.g., US Weather Bureau, HQ14 Marines, etc.

6.1.6.5.2 MAJCOM Agency. Enter the abbreviation of the major command of Air Force activities supported; e.g., ACC, AMC, USAFE, etc. Enter the name or abbreviation of the parent agency of non-Air Force activities supported; e.g., Army, DMA, FAA, contractor, etc.

6.1.6.5.3 Location. Enter the location of the activity supported; e.g., Carswell AFB TX; Ceggia, Italy, etc.

6.1.6.5.4 PMEL. Enter the quantity supported by and accomplished in the reporting PMEL for each activity identified in the UNIT DESIGNATION column. Do not duplicate the quantity shown in the TFCU and ON-SITE columns.

6.1.6.5.5 DEPOT. Enter the quantity supported by other sources such as a technical repair center, air logistic center PMEL, other off-base PMEL, contractor (other than lab contractor, if the lab is operated by a contractor), etc., for each activity identified in the UNIT DESIGNATION column.

6.1.6.5.6 TFCU. Enter the quantity supported using the TFCU. Identify the quantity for each activity in the UNIT DESIGNATION column. Quantities included in the PMEL, DEPOT, and ON-SITE columns shall not be entered in the TFCU column. Also enter the actual or estimated total annual miles traveled and total annual days TDY in the designated spaces. Quantities supported using the jet engine test stand calibrator shall be reported in the ON-SITE column.

6.1.6.5.7 On-Site. Enter the quantity supported on-site by the reporting PMEL for each activity identified in the UNIT DESIGNATION column using equipment other than a TFCU. Do not include the quantity listed in the PMEL and TFCU columns.

6.1.6.5.8 Mobility. Enter the total quantity of TMDE coded as Mobility (i.e., contains M in the On Mobility PAMS field).

6.1.6.5.9 WRM. Enter the total quantity of TMDE coded as WRM (i.e., contains a W in the On Mobility PAMS field).

6.1.6.5.10 Total. Enter the total quantity supported for each of the PMEL, DEPOT, TFCU, ON-SITE, WRM, and MOBILITY columns at the bottom of each column.

6.1.7 SECTION III, PERSONNEL.

6.1.7.1 Block 18, Military.

6.1.7.1.1 UDL Auth. Enter the number of military personnel by CAFSC currently authorized.

6.1.7.1.2 PMEL ASGD. Enter the number of military personnel by CAFSC currently assigned.

6.1.7.1.3 ASGD FR Maint. Enter the number of military personnel by CAFSC assigned full time to the PMEL from authorizations of the Chief of Maintenance or comparable office.

6.1.7.1.4 Total. Enter the totals for each column under Block 18.

6.1.7.2 Block 19. Civilian. Enter the series and grade of civilian personnel assigned to the PMEL; the number authorized; the number assigned; the number assigned full time from the authorizations of the Logistics Group Commander or comparable office; and the totals for each column under Block 19.

6.1.7.3 Block 20, Number of Assigned Persons Performing Direct Labor. Enter the number of persons assigned to the PMEL whose primary duty is to calibrate and repair TMDE; i.e., those technicians assigned to labor code 100.

6.1.8 SECTION IV, FACILITIES.

6.1.8.1 Space Available (ft^2).

6.1.8.1.1 Total PMEL (Gross Space). Enter the exterior dimensions of the building. If the PMEL is a joint occupant of a building, enter the exterior dimensions of the area occupied by the PMEL function and the percent of the total building occupied.

6.1.8.1.2 Calibration and Repair Area. Enter the interior area (ft^2) of the room(s).

6.1.8.1.3 Office Area. Enter the interior area (ft^2) of the room(s).

6.1.8.1.4 Receiving/Issue/Storage Area. Enter the interior area (ft^2) of rooms used for these functions and bench stock.

6.1.8.1.5 Training/Tech Lib/Break Area. Enter the interior area (ft^2) of the room(s).

6.1.8.1.6 Cleaning Room. Enter the interior area (ft^2) of the room(s).

6.1.8.1.7 Other. Identify the purpose of the room(s) and enter interior area (ft^2).

6.1.9 SECTION V, SELF-SUFFICIENCY. This data is used for analysis by AFMETCAL Det 1 and the FAMS in determining the equipment support plans and other PMEL support problems. It also includes a list of items sent out for contract repair or calibration, plus a list of items under warranty and failed during this reporting period.

6.1.9.1 Self-Sufficiency List. Attach to the AFTO FORM 80, a listing of TMDE end items for which the PMEL has responsibility that must be sent to some other PMEL (usually a Type IIA PMEL) for calibration. Do not include items that are coded AFPSL in the calibration responsibility field of a CMS or T.O. 33K-1-100-2/-2MT-0. Include those items sent to another military service lab for calibration or repair. Include the ISA number in remarks column. If there is no ISA, enter "no charge" in remarks column. In addition, also record the items sent out on contract.

6.1.9.2 Headings for List. Lists shall be titled "Self-Sufficiency Report for *PMEL name*" and dated. Columnar headings for this list shall be:

* a. Model/Part Number Type.

* b. Manufacturer.

* c. Nomenclature.

d. Calibration T.O. Number. Columns (a) through (d) shall be entered and sequenced as items listed in T.O. 33K-1-100-2/-2MT-0. Reported items not listed in T.O. 33K-1-100-2/-2MT-0 shall be added to the list in part number sequence after all T.O. 33K-1-100-2/-2MT-0 items are listed.

e. Quantity. This entry shall reflect the total quantity of this item (part number) not supportable by the PMEL.

f. Where Sent. List the designation of the activity providing support.

g. Reason. Indicate what capability the PMEL lacks to provide calibration.

* h. Remarks. Indicate whether the lack of capability is permanent or temporary. If temporary, indicate what action has been taken to attain capability and an estimated time when full capability will be achieved. For warranty items sent out, enter serial number of the item and contract number.

**i. Weapon system the item supports.

* Only entries required for warranty items.

** Entries required only for contract items.

6.1.10 Maintenance Data. This data is used by AFMETCAL DET 1/MLS to analyze reliability of TMDE and to adjust their calibration intervals. Attach to the report the MDC data for the reporting period from PAMS on MS-DOS formatted disks. Data may be submitted on 5 1/4" or 3 1/2" disks in regular or compressed format. The 3 1/2" disks are the preferred medium. Data may also be E-mailed as an attachment to **afmetcal.mdc@afmetcal.af.mil**. The data format shall be the same as the JDD AFS77SU data for the DO56 data system. If you need assistance in transferring the data from PAMS to disks, contact the PAMS Field Assistance Branch at Maxwell AFB, Gunter Annex AL, DSN 596-5771. If the PMEL does not use PAMS, submit the maintenance data as directed by AFMETCAL Det 1.

6.2 PMEL REPORT RCS: HAF ILM (A) 9450, PMEL INVENTORY LISTING. This annual report was established to allow generation of a database that identified all items supported by any PMEL in the Air Force. It also permits generation of a list of PMELs that support a particular part number/model, as an example. The database is located in AFMETCAL Det 1.

6.2.1 Report Requirements. This report requires that each PMEL provide a copy of the Local-Master-ID.Dat and OWC-Master.Dat files on a quarter inch cartridge tape produced on the PAMS system. If the PMEL does not use PAMS, submit the inventory as directed by AFMETCAL Det 1. The total quantities of items contained in the inventory shall be equal to the total items supported as reported in your 7808.

6.2.2 Date Due. The annual tape shall be current as of 31 December and shall arrive at AFMETCAL Det 1 not later than 31 January. Ensure that the mailed tape is in a package with the Optional Form 85 or an equivalent notice on it to prevent damage to the cartridge from magnetic fields.

SECTION 7

PMEL ASSESSMENT AND CERTIFICATION PROGRAM

NOTE

Section 7A of last revision is now Section 7. All references to Sections 7 or 7A shall apply to this section.

7.1 PMEL ASSESSMENT AND CERTIFICATION. As directed by AFI 21-113, AFMETCAL Det 1 is the Air Force focal point for the AFMETCAL Assessment and Certification Program. It maintains a system to assess and certify calibration laboratories for compliance with this T.O. and other Air Force directives. The Assessment and Certification Program objective is to assess each PMEL capability to perform measurements that are accurate, uniform, reliable, and traceable through the AFPSL to the National Institute of Standards and Technology (NIST) or other AFMETCAL Det 1 approved sources. An AFMETCAL Program Certificate of Compliance shall be awarded when a PMEL meets assessment criteria.

7.2 ASSESSMENT INTERVALS. The assessment team will assess each PMEL approximately every 24 months. Some short tour locations are assessed annually. Out-of-cycle assessment s may be performed as required.

7.3 CERTIFICATION PROCESS. There are three stages in the PMEL certification process: Preassessment, On-site Assessment, and Certification review.

7.3.1 Preassessment. This includes a review of the PMEL quality system documentation to assess its compliance with this T.O. and other Air Force directives.

7.3.1.1 All laboratories shall submit the following:

a. Quality manual.

b. Master inventory data.

c. Previous 12 months of QP summary data as detailed in Section 9.

d. Copies of critical nonconformity worksheets with all associated documentation.

e. Trend analysis based on the QP findings.

f. Summary of environmental data as described in paragraph 7A.3.2.2d.

g. A listing by K Stamp number of the technicians qualified in each measurement area.

7.3.1.2 Quality system documentation shall be resubmitted upon change of contractor or significant PMEL reorganization. All data shall be submitted to AFMETCAL Det 1. To the greatest extent possible, data shall be submitted in electronic format and through electronic means. The certification office shall retain a file of all PMEL quality manuals and shall request updated documentation from each PMEL approximately six months prior to the projected on-site assessment. On-site assessment shall be scheduled after the PMEL quality system documentation is reviewed by AFMETCAL Det 1/MLC. The Assessors shall notify the PMEL in writing of deficiencies in quality system documentation. The PMEL shall identify corrective actions and send the documentation to AFMETCAL Det 1 within 30 calendar days of written notification.

7.3.2 On-site Assessment. As a minimum the on-site assessment shall assess:

a. The PMEL implementation of their documented quality system

b. Measurement Capability Assessment (MCA): This shall include, but not be limited to processes for calibrating standards and TMDE; application of metrology principles and procedures; and condition and use of PMEL standards. The Assessment Team Chief, based on scope of calibrations performed and number of certifying technicians shall select processes. The Assessment Team Chief shall provide PMEL management with a copy of the assessment plan during the in-briefing. Each TFCU and on-site operation shall also be subject to assessment and the results combined with the main PMEL to produce a final result

c. Compliance with QP requirements

d. Compliance with facility and environmental requirements

7.3.2.1 PMEL Notification. AFMETCAL Det 1 shall provide the maximum practical advance notice to the affected command of the plan to visit their installation. For announced visits, the MAJCOM Gatekeeper shall notify the PMEL to be visited and all other interested parties of the following information: purpose of the visit, assessment team identity, and their arrival and departure dates.

7.3.2.2 Arrival Support Needed. The following information and support shall be available when the assessment team arrives:

a. The PMEL Quality Manual, and referenced quality documents

b. Full names, grades, titles, and mailing addresses of commanders and/or senior level managers

c. PMEL floor plan annotated with room, square footage, and location of ECS monitors

d. Environmental charts since the last on-site assessment, Environmental Restriction Log, and a summary of environmental data for each environmental monitor to include:

(1) Total hours recorded

(2) Total hours temperature above applied limits

(3) Total hours temperature below applied limits

(4) Total hours relative humidity above applied limits

(5) Total hours relative humidity below applied limits

(6) Total hours overlap (both temperature and humidity outside limits)

(7) Total hours of missing data (dry pens, clock stopped, chart overrun)

e. Copies of open facility and ECS work requests

f. Copies of command or local publications applicable to the operation of the PMEL

g. All records since the last on-site assessment applicable to the PMEL QP. This includes documentation of root cause analysis for all critical nonconformities identified and trend analysis performed.

h. Geodetic survey data

i. Documentation of facility ground measurements

j. RADIAC Program documentation (if applicable)

k. Records of qualifications, training, skills, and experience for all assigned personnel

l. Transportation, billeting, and other assistance as required

7.3.2.3 On-site Team Actions. The assessment team shall:

a. Upon arrival, brief PMEL personnel and the highest level commander (or designated representative) on the installation having jurisdiction over the PMEL to explain the purpose of the visit and assessment criteria to be used

b. Perform the assessment

c. Prior to departure, brief PMEL personnel and the highest level commander (or designated representative) on the installation having jurisdiction over the PMEL on the preliminary findings of the on-site assessment

7.3.2.4 Findings. Findings shall be documented as problems or observations as follows:

a. **Problems** are those deficiencies that affect the PMEL ability to perform accurate and traceable measurements or demonstrate non-compliance with published directives. To achieve certification, all identified problems shall be corrected or identified in a corrective action plan (CAP). A CAP shall be requested when identified problems are significant enough to require a formal response from the PMEL. When requested, the CAP shall be provided to AFMETCAL Det 1 within 60 calendar days of the final report date. The CAP shall contain as a minimum: the documented problem(s), detailed corrective actions, and a time schedule for resolution of the problem(s).

b. **Observations** include minor deficiencies that do not directly affect accuracy or traceability; recommendations that may improve products, processes, or services, and positive comments. Observations do not affect certification and do not require a response from the PMEL. However, when a large number of observations are noted and the cumulative effect may be detrimental to the quality of PMEL products, processes, or services, the assessment team may document the overall situation as a problem

7.3.3 Proficiency Testing (PT). Proficiency Testing is the process used to assess a laboratory's performance by means of comparing and evaluating calibrations or tests on a measurement artifact. Measurement artifacts will be sent to the PMELs to be measured and the results will be compared to measurements made at the AFPSL on the same artifact.

7.3.3.1 The PT program shall use a sampling approach as it would be impossible to conduct proficiency tests for all parameters and ranges in which PMELs perform calibrations. Measurement artifacts shall be distributed to PMELs by the AFPSL based on a schedule determined by AFMETCAL Det 1. PMELs shall be required to complete proficiency testing as directed by AFMETCAL Det 1. The number of proficiency tests required of each PMEL annually will vary depending on the availability of measurement artifacts, but shall not exceed six (6) annually. The AFMETCAL Assessment and Certification Program shall consider the results of proficiency tests as objective evidence, along with preassessment and on-site assessment findings, of the PMEL's ability to perform competent calibrations.

7.3.3.2 The PMEL shall be required to perform measurements on an artifact using the same calibration methods used to calibrate customer's equipment or methods directed by AFMETCAL Det 1. The PMEL shall report results as indicated in the PT instructions and data sheets provided by AFMETCAL Det 1. The PMEL is expected to complete proficiency testing of a measurement artifact within the time allotted in the PT instructions. The measurement artifact is not to leave the PMEL unless otherwise directed by the PT instructions.

7.3.3.3 Unless otherwise stated in the PT instructions, the performance of the proficiency test is judged by calculating the error, normalized with respect to the uncertainty, of the measurement as follows:

$$E_{\text{normal}} = \left| \frac{Value_{\text{PMEL}} - Value_{\text{ref}}}{\sqrt{Uncertainty_{\text{PMEL}}^2 + Uncertainty_{\text{ref}}^2}} \right|$$

Where
E_{normal} = normalized error of the PMEL
$Value_{\text{PMEL}}$ = the value as measured by the PMEL
$Value_{\text{ref}}$ = the value as measured by the AFPSL (reference lab)
$Uncertainty_{\text{ref}}$ = the overall uncertainty of the AFPSL (reference lab)
$Uncertainty_{\text{PMEL}}$ = the overall uncertainty of the PMEL (i.e. Measurement uncertainty that would be provided to a customer)
Note: All Values and Uncertainties shall be expressed in the same units. To pass the proficiency test the PMEL shall have a value for E_{normal} less than 1 (i.e. $E_{\text{normal}} < 1$).

7.3.3.4 Proficiency testing shall be scheduled by the AFPSL on behalf of AFMETCAL Det 1. PMELs shall be notified in advance as to the approximate arrival date of the measurement artifact. Instructions for performing the test, reporting results, notifying AFMETCAL Det 1 and the AFPSL, and shipping will be included with the measurement artifact.

7.3.3.5 AFMETCAL Det 1 shall notify the PMELs of their proficiency testing results. If a PMEL has been certified prior to the completion of the proficiency test, the status of the certification may change as a result of a failed proficiency test. The PMEL's certification status may be changed to reflect a partial certification or completely suspended pending the PMEL's ability to successfully complete the proficiency test at a later date.

7.3.4 Certification Review. Certification review begins upon completion of the on-site assessment. During this period all PMELs shall be in a status of "certification pending" until the Commander of AFMETCAL Det 1 renders

a certification decision that is published in the final evaluation report. During certification review, the Certification Office shall validate assessment findings and review short term PMEL corrective actions. On completion of the certification review, the Certification Office shall forward a recommendation to the Commander of AFMETCAL Det 1 to certify, withhold, or close the PMEL.

7.3.4.1 Certification Criteria. The following criteria shall be used to determine if a PMEL meets the minimum requirements for certification:

a. Quality System Documentation. The PMEL Quality Manual shall meet the requirements of this T.O.

b. Measurement Capability Assessment. The PMEL shall demonstrate the capability to perform traceable measurements.

c. Total Quality Program. The QP shall meet all requirements of this T.O.

d. Facility and ECS. The facilities and ECS shall comply with operational requirements of this T.O. and applicable Air Force directives.

e. PT/MAP. Documentation and measurement results shall comply with the requirements of this T.O.

7.3.4.2 Certification Decision. AFMETCAL Det 1 shall certify the PMEL when assessment results and any corrective actions demonstrate the PMEL is compliant with this T.O. When assessment results indicate that the PMEL does not meet certification criteria, AFMETCAL Det 1 may convene the PMEL Certification Panel and/or take one or more of the following actions:

a. Certify the PMEL.

b. Determine specifically what is needed to bring the PMEL to full capability.

c. Initiate corrective action within the capability of the AFMETCAL Det 1.

d. Notify the Air Staff and the major command of the reasons for considering the PMEL incapable, any limitations imposed, the actions required to achieve certification, and recommendations for obtaining calibration support pending completion of corrective actions.

e. Conduct technical assistance visits to aid in resolving problems when requested by the major command.

f. Withhold the PMEL certification until the problems identified during the assessment are corrected.

g. Recommend the assessment team perform a follow-up on-site assessment. AFMETCAL Det 1 shall coordinate this action with the affected MAJCOM.

h. Recommend closure.

7.4 CERTIFICATION STATUS. PMEL certification status shall be specified in the final assessment report as one of the following:

7.4.1 Certified. A PMEL whose quality system documentation, MCA, QP, PT/MAP, facilities, and ECS demonstrate the PMEL has the capability to perform accurate and traceable measurements shall be issued a Certificate of Compliance at the conclusion of the on-site assessment. The certificate, combined with the final assessment report, is proof of compliance with this T.O. and other applicable Air Force directives. The Certificate of Compliance shall remain in effect unless revoked by AFMETCAL Det 1. All previous certificates are void when a new certificate is awarded. Certification shall be reassessed if the contractor changes or the PMEL relocates to a different facility. (Facility may include FASTCAL units and on-site operations used as an extension of the main PMEL). AFMETCAL certification is proof of AFMETCAL Program compliance and should not be confused with third-party accreditation under commercial guidelines.

7.4.2 Certification Pending Post on-site assessment period during which the Certification Office is reviewing evaluation results and short term PMEL corrective actions.

7.4.3 Certification withheld. The PMEL failed to demonstrate the capability to consistently perform accurate and traceable measurements.

7.4.4 Not certified, recommended for closure. Problems in quality system documentation, MCA, QP, facility, ECS, or PT/MAP prevent the PMEL from making accurate and/or traceable measurements and resolution is not expected.

7.5 ASSESSMENT REPORTS. The assessment team shall prepare a report for each assessment.

7.5.1 Report Content. The report shall concisely and clearly describe the effectiveness of the quality system documentation, MCA, QP, facility, ECS, or PT/MAP.

7.5.2 Report Distribution. AFMETCAL Det 1 shall distribute one copy of the report for all PMEL assessments to the Wing Commander (or equivalent) and the affected major command. For laboratories not certified, one copy of the final report shall be forwarded to HQ USAF/ILMM. One copy of all reports shall be maintained at AFMETCAL Det 1.

7.6 APPEAL PROCESS. The PMEL may appeal any finding or comment in the assessment report or the decision of AFMETCAL Det 1 by forwarding relevant information to AFMETCAL Det 1. AFMETCAL Det 1/CC may convene the PMEL Certification Panel for advice. The subsequent decision of the AFMETCAL Det 1/CC is final.

SECTION 8

PMEL FACILITY OPERATIONAL REQUIREMENTS

NOTE

This section does not contain PMEL design criteria. They are contained in AFMAN 32-1094 Criteria for Air Force Precision Measurement Equipment Laboratory Design and Construction.

8.1 GENERAL REQUIREMENTS. This section contains PMEL facility operating parameters and/or notes concerning environment, power, lighting, air filtration, air locks, controlled areas, cleaning area, flooring, ceilings, and other subjects. One purpose of this section is to ensure that PMELs placed in buildings not built according to AFMAN 32-1094 meet minimum requirements. This section also contains some of the general information needed to determine space requirements within some of the lab areas. The data in this section provides guidance for the day-to-day operation of the PMEL as it relates to the facility. PMEL management shall make every effort to establish and maintain the PMEL facility in a condition facilitating proper performance of calibrations/verifications.

8.1.1 Design Criteria. AFMAN 32-1094 contains the design criteria for PMELs and shall be complied with when modifying an existing PMEL or designing a new PMEL facility. PMEL designs and layouts shall be evaluated on an individual basis and shall depend upon mission requirements. Assistance for determining facility requirements may be obtained from AFMETCAL Det 1/ML. Each PMEL shall maintain a file reflecting any deviation from AFMAN 32-1094, which was approved by AFMETCAL Det 1/ML and/or HQ AFCESA.

8.1.2 PMEL Power Requirements. PMEL power requirements are listed in AFMAN 32-1094. Equipment, which is critically sensitive to line voltage variation, shall require additional voltage regulation through use of bench type regulators and/or filters.

8.1.3 Grounding Requirements. The ground in the PMEL shall be checked to ensure it has retained its validity per AFI 32-1065 (once every two years). Measurement techniques for grounds are shown in T.O. 31-10-24. Proof of this validation shall be maintained by PMEL management in the form of a letter or certificate from Civil Engineering.

8.1.4 Geophysical Surveys. Most PMELs require certain geophysical surveys to be performed. AFI 14-205 gives information about obtaining these surveys. These surveys are only required when any of the following sub-paragraph measurement capabilities are required. Surveys are as follows:

a. World Geodetic System of 1984: Geodetic positions, Latitudes and Longitude in degrees, minutes, and seconds. Required in order to perform accurate time measurements. Loran C requires a minimum 10 arc seconds accuracy for latitude and longitude.

b. International Gravity Standardization Net of 1971 (IGSN 71): Gravity information in milligals. The required accuracy for use with dead weight piston pressure standards is 25 mGals. As long as the PMEL does not move, there is no need for an update. If your PMEL has moved to a new location, then your force and pressure standards shall be recalibrated using the new gravity value before they can be used to obtain maximum accuracy.

c. Astronomic Data. Astronomic azimuth in degrees, minutes, and seconds. Needed if the PMEL is supporting north-seeking gyro-compass units. Accuracy needed is 10 arc seconds or less.

8.2 PMEL ENVIRONMENT. T.O. 33K-1-101 identifies the measurement restrictions of measurement standards. To ensure measurement accuracy, it is necessary to maintain continuous control of the environment in which the measurement standards are maintained. Temperature, humidity, dust, vibration, and electromagnetic interference can each have a detrimental affect on the ability of a standard to ensure measurement accuracy of TMDE. Each of the environmental factors impact calibration and repair operations to a different degree. It is a fact that most standards change value with a change in temperature. The temperature limits placed on the PMEL ensure that the measurement confidence level meets the needs of some of the more precise equipment. Humidity control is becoming a very significant environmental need in the PMELs, especially at the lower humidity levels because of the potential for electrostatic discharge (ESD) damage to integrated microcircuitry, as well as its interference with sensitive measurements. Therefore, a PMEL whose environment goes outside the limits for temperature and humidity cannot ensure calibration accuracy and/or presents an operating hazard to some element of the measurement setup. The calibration procedures may provide other restrictions.

8.2.1 PMEL Environmental Control System (ECS) Effectiveness. When the PMEL ECS cannot maintain environmental specifications 90% of the time or more, aggressive action on the part of PMEL/upper-level management is required. Excessive out-of-tolerance periods can contribute to production slow-downs or stoppages.

8.2.2 Documenting ECS Outages. Lab management shall ensure nothing listed as environmentally sensitive is to be calibrated during environmental outages, unless special provisions are made, documented, and the documentation kept on file.

8.2.3 PMEL Operational Environment. The following operational environmental requirements apply only to a PMEL area where calibration/ repair is performed. Particular care shall be taken when calibration/ repair is performed at a site other than the permanent PMEL premises. Keep in mind these are operational requirements, not design requirements.

8.2.3.1 Present measurement needs dictate the operational temperature in the PMEL facility shall be controlled as follows, unless the calibration procedure specifies other restrictions:

8.2.3.1.1 Calibration and Repair area. A temperature of 73°F ±6°F (22.8°C ±3.3°C) in the calibration and repair areas of Type II or III PMELs, except for the 68°F dimensional calibration area.

8.2.3.1.2 Dimensional 68°F Calibration and Repair area. A temperature of 68°F ±1.0°F (20°C ±0.56°C) shall be maintained in the 68°F dimensional area of PMELs where 68°F dimensional areas are authorized (see paragraph 10.3). The 68°F dimensional calibration area criteria is based on the need for a closely controlled environmental area for calibration and use of higher accuracy dimensional TMDE. By international agreement the true size and shape of an object is that which exists at a uniform temperature of 68°F (20°C).

8.2.3.1.3 Temperature in the low and high intensity Radiac area may vary from 73°F to ±15°F. The relative humidity in the area during calibration shall not exceed 70%. Another condition is that the meters shall not be stored for any extended periods in an environment with RH above 50%.

8.2.3.2 An optimum operational humidity level is 35% RH. The relative humidity shall not be allowed to go lower than 20% RH or exceed 50% RH in any Type II or Type III PMEL.

8.2.3.3 Temperature and humidity shall be monitored and recorded continuously. Span calibrations are encouraged for recorders used to monitor the environment in calibration areas. The span shall cover the operational requirement of the PMEL. The following rules apply to temperature and humidity chart recorders: 1) Recording devices monitoring 68 °F calibration and repair areas shall be calibrated a minimum of +/- 0.5 °F, 2) Recording devices monitoring 73 °F calibration and repair areas shall be calibrated a minimum of +/- 2.0 °F, 5% RH.

8.2.3.3.1 Typically a recording device 1s be required for each 2000 ft^2 of calibration and repair area or per room if smaller than 2000 ft^2.

8.2.3.3.2 Recording device(s) shall be located in close proximity to areas where the most stringent calibrations are performed. Locate the recording device so that exterior wall temperature, high heat producing equipment, and supply air do not adversely affect the recorder indication.

8.2.3.3.3 Psychrometer readings (accomplished IAW established calibration procedures for hygrothermographs) shall be accomplished weekly (usually at the time of chart change) to check the accuracy of the recorder. The start and stop date, standard thermometer, psychrometer, (wet bulb and calculated humidity) shall be annotated on each chart.

NOTE

If the temperature and humidity chart recorder meets required accuracy and is calibrated through the entire span of the PMEL applicable temperature and humidity range, psychrometer readings are not required.

8.2.3.3.4 Some recorders are slow responding. Differences between the psychrometer and recorder do not necessarily mean adjustments are required. Ensure the psychrometer is used properly and take a number of readings. Adjust the recorder only if repeated comparisons indicate the need.

8.2.3.3.5 For those recorders not requiring weekly chart changes (i.e., continuous roll type graph or other electronic recorder) a psychrometer check is only required after any of the following instances:

- Quarterly
- Graph paper is changed (if the recorder uses graph paper)
- If any malfunction is suspected

If logging psychrometer readings on recorders of this type is impractical, a log may be substituted for recording the readings. Should the psychrometer readings indicate a recorder is outside its rated accuracy for either temperature or relative humidity, the recorder shall then be adjusted within tolerances. It is also recommended that the environmental charts for each area monitored be filed in separate folders to facilitate periodic review. Span calibrations are encouraged for recorders used to monitor the environment in calibration areas. The span shall cover the operational requirement of the PMEL.

8.2.3.4 Because the measurement accuracy of many standards is affected by environmental changes, the environment shall be maintained within the foregoing environmental criteria (limits). This includes periods when the PMEL is not in operation but items are being "soaked" prior to calibration. When this is not possible, the following applies:

a. When the environmental system regains control, the PMEL environment shall be allowed to reach stability. Humidity out-of-tolerance conditions do not require a soak time, but metallic surfaces may require cleaning during and after periods of high humidity. The stable condition starts when the temperature excursions remain within the 73°F ±6°F range (68°F ±1° for the dimensional area) and repeatable measurements can be made. This time is sufficient for all measurements except as follows:

   (1) Optical Flats (7 inches in diameter and larger): Do not calibrate or use without a "soak" time of 3 hours for every hour the environment is out-of-tolerance, up to a maximum of 24 hours "soak" time.

   (2) Linear dimensions (1 inch and shorter): For accuracies better than ±0.0001 inch, provide a "soak" time of one and one-half hours for each hour the environment is out of specification to a maximum of 12 hours prior to calibration or use of instruments.

   (3) Linear dimensions (longer than 1 inch): For accuracies of ±0.0001 inch/inch through ±0.001 inch/inch, provide a "soak" time of one and one-half hour for each hour the environment is out-of-tolerance up to a maximum of 12 hours prior to calibration or use. For accuracies better than ±0.0001 inch/inch, provide a "soak time" of three hours for each hour the environment is out-of-tolerance up to a maximum of 24 hours.

   (4) In each temperature case identified above, the total "soak" time shall be equal to that specified, plus any waiting time that may be required to achieve repeatability of readings.

b. PMEL operations affected by humidity shall cease as long as the humidity is out of specifications. No trouble shooting/repair shall be performed on ESD vulnerable (CMOS-MOSFETs-MOS) solid-state equipment when the humidity falls below 20% unless the following occurs: The use of ion generators may provide an acceptable environment for a localized area such as a workbench with a low ESD potential. This would permit repair and calibration on the bench even though the rest of the calibration and repair area is below the 20% humidity level. The PMEL shall periodically monitor the operation of ion generators to ensure the ion generator is providing safe ESD environmental conditions. ESD control procedures are described in DOD Handbook-263, DOD-STD-1686, and T.O. 00-25-234.

8.3 TMDE ENVIRONMENTAL RESTRICTIONS. PMELs shall conform to the maintenance T.O. or manufacturer's data regarding any environmental limitations or temperature coefficients of any item used in a measurement setup. The calibration T.O. may make specific environmental conditions, which shall be met, for the calibration.

8.4 DUST LEVELS. Dust is an enemy that makes it difficult to make accurate measurements in some measurement areas. The easiest way to keep dust out of the PMELs calibration and repair area is to have a positive airflow from the environmental system and/or locate the PMEL within an area of a building, which is relatively dust-free. Ensuring the filters in the ECS are clean is another major factor in keeping dust levels down. Vacuum cleaning, use of lint free dust cloths, and reduction of horizontal plane surfaces minimizes the effects of dust. Devices producing dust or residue particles from grinding or abrasion shall not be installed in, or used in, the calibration and repair area of the PMEL.

8.5 NOISE. It is recommended that the noise level in the PMEL be no greater than 70 dB. AFOSH STD 48-19, Chapter 2, identifies hazardous noise exposure limits.

8.6 VIBRATION. The PMEL areas where calibration is performed shall be maintained as vibration free as possible. The cause of vibration, which affects the repeatability of TMDE, shall be identified and reduced to acceptable levels. The PMEL shall notify AFMETCAL Det 1/ML of any vibration problems that cannot be solved. An acceptable vibration level for a PMEL is anything less than 0.25 mm (10 μ in) from 0.1 to 30 Hz (displacement peak). The maximum acceleration peak is 0.001 G for frequencies from 30 Hz to 200 Hz.

8.7 ELECTROMAGNETIC INTERFERENCE (EMI)/RADIO FREQUENCY INTERFERENCE (RFI). EMI that causes degradation of equipment performance and disruption of calibration shall be suppressed or eliminated to the maximum extent possible.

8.7.1 New PMEL Facilities. The effects of EMI to PMEL equipment shall be minimized through the selection of locations for new PMEL facilities where the ambient radio frequency (RF) field strengths from 10 kHz to 18 gHz shall not exceed 1 V/m external to the proposed facilities. An electromagnetic compatibility (EMC) survey shall be performed for each proposed PMEL facility site. The results of the EMC survey shall be used to determine site suitability. The surveys shall be performed by the 738 EIS/EEEX in accordance with 38 EIW Instruction 33-101, Measurements and Specialized Engineering Services (MSES). Upon completion of the EMC survey, a formal engineering report shall be supplied to both the PMEL customer and AFMETCAL Det 1/ML.

8.7.2 Existing PMEL Facilities. EMI that causes degradation of equipment performance or disruption of calibration at existing sites shall be eliminated or suppressed to the maximum extent possible. The PMEL shall report apparent EMI problems to the 738 EIS/EEEX in accordance with AFI 10-707, Air Force Spectrum Interference Resolution Program. The 738 EIS shall provide on-site assistance in determining the source(s) of the EMI and propose solutions for the elimination or suppression of the EMI. Upon completion of the EMI survey a formal engineering report shall be provided to both the PMEL customer and AFMETCAL Det 1/ML.

8.7.3 Obtaining Related Assistance. An EMI or EMC survey shall be obtained through a request to the 738 EIS/EEEX at the following location:

738 EIS/EEEX
801 Vandenburg Ave, Ste 201
Keesler AFB MS 39534-2634

Voice: DSN 597-3920 Comm 601-377-3920
FAX: DSN 597-3956 Comm 601-377-3956

8.8 LIGHTING.

8.8.1 General Lighting. The general lighting for all occupied areas shall be balanced to minimize shadows and produce uniform illumination.

8.8.2 Minimum lighting. Minimum lighting levels are specified to reduce the need for additional lighting fixtures in the calibration and repair area because they become dust collectors and can interfere with setting up a measurement capability.

8.8.3 Uniform Illumination. Uniform illumination is defined as a distribution of light at the measured height where the maximum and minimum general illumination in the immediate work area (e.g., bench top, testset up) is not more than one-sixth above or below the average illumination in the area.

8.8.4 Measurement of Lighting. The average room illumination for general lighting shall be measured after 100 hours of use in the calibration and repair area at the level of the horizontal working surface of the PMEL bench and in the administrative areas at desk top level. The surface shall be free of items and adjacent personnel during the measurement so as to minimize shadows on the light meter sensor. The illumination level can drop drastically during the initial burn-in time.

		Absolute Minimum
a.	Calibration/Repair/Dimensional	50 Foot Candle(FC)
b.	Cleaning	50 FC
c.	Office and Administrative	50 FC
d.	Technical Library	50 FC
e.	Training Room	50 FC
f.	Receiving, Issue	50 FC
g.	Bench Stock	20 FC
h.	AWM/AWP Holding	10 FC

i.	Stairways, Corridors, Airlock	20 FC
j.	Elevators, Shipping Dock	20 FC or *
k.	Restroom, Utility, Storage	10 FC or *

* Not less than 1/5 of the brightest adjacent traffic area.

8.8.5 Supplementary Lighting. Additional general lighting shall be used for tasks that are difficult to perform within the ambient light level.

8.8.6 Lighting Fixtures. Fluorescent lamps shall be used wherever possible to conserve energy. Relamping of fluorescent luminaries shall be done using new fluorescent lamps of a white or daylight variety. They shall have an initial rated lumen output after 100 hours use of not less than 98% of the Illuminating Engineering Society rating for a cool white T-12 medium bipin lamp in the luminaire size lamp. Areas having special spectral emission requirements shall be lamped accordingly.

8.8.7 Energy Conservation. Lighting may be turned off during non-working hours providing:

8.8.7.1 Due consideration is given to the effects on air conditioning reheat systems to ensure that energy is used efficiently by turning off the lights.

8.8.7.2 Environmental limits can be maintained with the lighting turned off.

8.9 DOORS & WINDOWS. All windows and unused doors or other openings shall be sealed to prevent non-conditioned air infiltration and dust contamination from outside. Doors opening into the PMEL shall be designed and arranged so as to maintain effective dust and temperature controls. The doors for personnel passage shall be held to a minimum consistent with fire and safety regulations. A building with no windows in the calibration and repair area of the building is preferred because of the potential effect of the direct sunlight on measurement. There may be windows in the calibration and repair area as long as they are not in outside walls of the building because direct sunlight in the PMELs could cause higher temperature in small areas.

8.10 AIR LOCKS. Air locks shall be constructed at the entrance to the calibration and repair area of the PMEL. An exception can be made if the PMEL is contained inside another environmentally controlled building and the PMEL calibration and repair area has positive air pressure in relation to the outside environmentally controlled area. Shoe cleaners with a self-contained vacuum system (or external vacuum system) shall be located where they will be most effective in reducing contamination that might be carried into the calibration and repair area of the PMEL. Air locks and shoe cleaners are not required for Type IV PMELs. Carpeting shall not be installed in air locks due to possibility of the carpeting interfering with the operation of air lock doors.

8.11 CONTROLLED AREAS.

8.11.1 Dedicated Laser Room. Any laser system that would interfere with or cause a safety problem for adjoining operations shall be placed in a dedicated room or area. The base bioenvironmental engineer can assist in determining the need for a separate room. Also refer to AFOSH Standard 161-10. Size and configuration of the area depends upon the laser system. The HP 5528A is a typical laser not requiring a dedicated room.

8.11.2 Other Measurement Area, The PMEL shall define and control access to areas where unnecessary presence (electrostatic) or excessive body heat (cold room) may affect quality.

8.12 FLOORING. Selection of a floor covering for the calibration area is based on the characteristics of durability, resilience, ease of maintenance, and electrical insulation properties. Light colors are recommended due to their reflection. Carpeting is not permitted due to dust collection and ESD concerns. A high grade of commercial vinyl plastic floor covering material of continuous length is preferred. Installed asphalt, rubber, vinyl asbestos, or vinyl tile that is in serviceable condition may continue to be used. Deteriorating vinyl asbestos tile may become a hazard. Contact your local bioenvironmentalist if the vinyl asbestos tile begins to deteriorate. Tile seams shall be flush and tight. Coved corners and edges are desirable to simplify cleaning. The continuous length floor covering provides a higher resistance to ground than the individual tiles and it simplifies the cleanup of hazardous materials such as mercury spills. Do not wax the floors.

8.13 FURNITURE AND FIXTURES. All furniture and fixtures shall be of a design that prevent accumulation of dust and facilitate cleaning. Working surface shall be covered with laminated plastic that is resistant to heat, chemicals, chipping, or other deterioration. Cabinets or lockers will be flush mounted, if possible.

8.14 COORDINATION OF PLANS FOR FACILITY PROJECTS.

8.14.1 AFMETCAL Det 1/ML. When any PMEL or major command first decides to build a new PMEL or modify an existing PMEL, AFMETCAL Det 1/ML shall be provided all justification available so AFMETCAL Det 1/ML can update long range planning and ensure interservice coordination of applicable projects. AFMETCAL Det 1/ML shall forward appropriate comments and recommendations to the command headquarters.

8.14.2 Unit Coordination Needs. When a project is approved for construction of a new facility or modification/improvement of an existing facility, the PMEL superintendent shall ensure that the command's PMEL functional area manager is placed on distribution and provided with a copy of the design criteria, specifications, and drawings.

8.15 DESIGN AND CONSTRUCTION CRITERIA FOR PMELs.

8.15.1 General References. Design and construction criteria for Type II() and Type III PMELs are

contained in AFMAN 32-1094, Criteria for Air Force Precision Measurement Equipment Laboratory Design and Construction. The criteria shall apply to all new construction, modification, and repairs of existing facilities. These criteria shall not be used as sole justification to improve facilities if conditions of existing facilities do not adversely affect the environmental requirements or mission performance of the PMEL

8.16 F-15 TYPE IV AND SUPPORTING TYPE II () FACILITY REQUIREMENTS.

8.16.1 Type IV PMEL Requirements.

8.16.1.1 Electrical Power.

a. 200 wye/115 +3-7 VAC, 3 Phase, 4 wire, 400 ±20 Hz, 10 KVA.

b. 120 VAC ±10% 1 Phase, 3 wire, 60 ±6 or 50 ±3 Hz, 20 KVA.

c. 240 VAC ±10% 1 Phase, 3 wire, 60 ±6 or 50 ±3 Hz, 10 KVA.

d. Grounding shall be in accordance with AFMAN 32-1094, measurement techniques per T.O. 31-10-24.

8.16.1.2 Lighting. (See para 8.8.)

8.16.1.3 Temperature and Humidity Controls. A temperature of 73°F ±9°F and humidity control of 15 to 70% RH shall be maintained in the calibration and repair areas. The measurement restrictions of Table 2 in T.O. 1F-15A-37 apply. Temperature and humidity shall be continuously monitored and recorded.

8.16.1.4 Floor Space. Minimum space to support one ESS is 1,634 ft^2. Two ESSs require 2234 $feet^2$. This may vary if the unit has been mobilized. If the Type IV is consolidated into the Type II, this is the additional space that could be required in the Type II.

8.16.1.5 Additional Requirements.

8.16.1.5.1 Capping of unmated connectors is not required.

8.16.1.5.2 A portable or central vacuum cleaning system is required to clean TMDE and for general housecleaning. Cleaning TMDE within the calibration/repair area is acceptable, but is restricted to use of vacuum, small brushes, and small hand-held nontoxic spray-and-wipe cleaning. Where toxic fumes, excessive dust, or other safety hazards exist, cleaning shall be accomplished in an approved area outside the calibration and repair area. This includes devices containing mercury, such as manometers and barometers.

NOTE

Eating or drinking in the Type IV is permitted only in a designated area set aside for that purpose. A designated eating area is not authorized in the Type IV if an existing break area is convenient. No calibration or repair is permitted in that area.

8.16.2 Type II () PMEL Supporting Requirements.

8.16.2.1 A 16' X 15' floor area is required within the calibration/ repair area to accommodate a 6' X 3' granite surface plate and a line-of-site area for optical calibration of a HUD Mount Alignment Adapter. Floor loading beneath the surface plate shall be capable of supporting the surface plate (3,000 pounds), a granite angle block

(1,500 pounds) plus other ancillary equipment. Total loading is for 5,000 pounds. The surface plate is mounted on either a tripod or a quadruped stand with four inch rectangular feet. Casters are normally provided on the stand.

8.16.2.2 An increase in workload of approximately 300 items of F-15 related support equipment could be expected in the Type II.

8.17 F-16 TYPE IV AND SUPPORTING TYPE II () FACILITY REQUIREMENTS.

8.17.1 Type IV PMEL Requirements.

8.17.1.1 Electrical Power.

a. 200 wye/115 +3-7 VAC, 3 Phase, 4 wire, 400 ±20 Hz, 10 KVA

b. 120 VAC ±10% 1 Phase, 3 wire, 60 ±6 or 50 ±3 Hz, 20 KVA.

c. 240 VAC ±10%, 1 Phase, 3 wire, 60 ±6 or 50 ±3 Hz, 10 KVA.

d. Grounding shall be in accordance with AFMAN 32-1094, measurement techniques per T.O. 31-10-24.

8.17.1.2 Temperature and Humidity Controls. Temperature shall be maintained between 73 ±9°F and humidity shall be maintained between 15 and 70% RH. These temperature and humidity limits differ from those of the Type II PMEL in order to permit use of the least restrictive facility requirements. These limits allow full use of the equipment. Temperature and humidity shall be continuously monitored and recorded.

8.17.1.3 Floor Space. Minimum area for one set is 1040 ft^2 , two sets is 1,600 ft^2. If the Type IV is consolidated into the Type II, this is the additional space that could be required in the Type II.

8.17.1.4 Lighting. (See para 8.8.)

8.17.1.5 Additional Requirements.

8.17.1.5.1 Capping of unmated connectors is not required.

8.17.1.5.2 A portable or central vacuum cleaning system is required to clean TMDE and for general housecleaning. Cleaning TMDE within the calibration/repair area is acceptable, but is restricted to use of vacuum, small brushes, and small hand-held nontoxic spray-and-wipe cleaning. Where toxic fumes, excessive dust, or other safety hazards exist, cleaning shall be accomplished in an approved area outside the calibration repair area. This includes devices containing mercury, such as manometers and barometers.

NOTE

Eating or drinking in the Type IV is permitted only in a designated area set aside for that purpose. A designated eating area is not authorized in the Type IV if an existing break area is convenient. No calibration or repair is permitted in that area.

8.17.2 Type II PMEL Support Requirements.

8.17.2.1 Type II () PMELs supporting the F-16 may require additional floor space to accommodate a 3' X 6' surface plate and stand. A surface plate of this size shall require a working area approximately 15 X 16 feet. Floor loading beneath the surface plate shall be capable of supporting approximately 5000 pounds (the 3500 pound surface plate plus ancillary blocks).

8.17.2.2 Selected area PMELs shall have a North-South 10 arc seconds Azimuth Reference for support of the gyrocompass units. The following Type II PMELs have the capability of calibrating the AG-8 and 522853 models:

a. Otis ANGB

b. Shaw AFB

c. MacDill AFB

d. Hill AFB

e. Nellis AFB

f. Luke AFB

g. Kadena AB (PACAF)

h. RAF Feltwell (USAFE)

8.17.2.3 Additional workspace may be required in a Type II PMEL supporting an F-16 ESS. An increase in workload of approximately 200 items of F-16 related support equipment can be expected in the Type II.

8.18 ENVIRONMENTAL LIMITS FOR USNS OBSERVATION ISLAND AND FASTCAL.

8.18.1 USNS Observation Island environmental operating limits are as follows:

Temperature	=	73 ±6°F.
Humidity	=	15% RH to 70% RH.

8.18.2 FASTCAL environmental operating limits are as follows:

Temperature	=	73 ±6°F.
Humidity	=	20% to 50% RH.
Optical/Dimensional units 1 and 2 = 68°±1°F.		
Humidity	=	20%RH to 50%RH.

SECTION 9

QUALITY PROGRAM (QP)

9.1 QUALITY PROGRAM. The QP is a significant part of the overall quality system. The purpose of the QP in the AFMETCAL Program is to ensure weapon system accuracy, reliability, safety, and traceability. The QP accomplishes two primary functions; collect PMEL quality data and use that data. First, PMEL personnel referred to as PMEL Quality Assurance (PQA) collect data to provide management personnel an overall picture of quality system effectiveness. PMEL management shall designate PQA personnel in writing and PQAs shall not review their own products or processes. Second, PMEL supervisors and managers use the collected QP data to proactively monitor and control the quality of PMEL products and processes. By using QP data to identify the most significant problems and negative trends, managers can implement corrective actions to eliminate or minimize these problems and trends. All QP activity shall be thoroughly documented.

9.2 TYPES OF REVIEW. Under the QP, there are three types of review. Two of these reviews focus on the quality of the product. They are Quality Reviews (QR) and Standard Reviews (SR). A nonconformity discovered in QRs and SRs is a negative indicator of laboratory performance. It means that a piece of TMDE or a laboratory standard, with a product quality defect, was certified by the laboratory. The third type of review, the Process Review (PR), is a management tool for internal investigation and process improvement and shall not to be used or reported as an indicator of laboratory performance. Finding PR nonconformities prevents QR and SR nonconformities. Because USAF PMEL workload is so diverse, it is impractical to sample enough TMDE to ensure end-of-line quality. Reviews under the QP are intended to sample PMEL production, categorize the defects, and determine the biggest problem areas in the PMEL. Management is then able to focus improvement efforts on the most significant laboratory problems. The QP is not intended to fix individual equipment deficiencies. Technicians, supervisors, and PQA personnel find and fix individual defects in the course of their daily activities.

9.3 QUALITY REVIEW. A QR is a complete review of TMDE produced or certified. The QR alone does not sample enough TMDE to assess the overall quality of PMEL production. However, it does reveal product quality defects that may be the result of a faulty laboratory process. These defects point management toward areas that require further investigation using root cause analysis.

9.3.1 TMDE shall be randomly selected and completed at a rate averaging no lower than 3 percent per any 12-month period. The following MDC Action Taken codes are subject to QR: A, B, F, G, J, K, V, X (except QRs), and NRTS codes 0-9. ATE and TMDE calibrated on site are subject to the same selection criteria and method of review. A QR may be bypassed only when extraordinary reasons preventing it from being performed. PMEL Management shall documented the local policy for bypassing QRs and document a method of pre-selecting TMDE for QR that are inherently difficult to sample once work is completed (e.g. off-base, priority, jet engine test stand, etc).

9.3.2 The QR includes the following:

a. Safety compliance.

b. Full parameter verification.

c. Physical condition.

d. Documentation (e.g. forms, labels, task qualification, etc.)

e. Traceability (e.g. standards, reports, technical data, environment, facility, etc.)

9.3.3 PMEL management shall document the procedures to be followed when full parameter verification is not performed. Although full parameter verification may not be possible on all items selected for QR, the review shall be performed even when the PMEL process did not include calibration. For example:

a. Items with NRTS action taken codes shall be verified to ensure the NRTS action is appropriate.

b. Items processed with 'G' action taken codes require verification that the item was properly repaired and that the repair did not affect calibration. This may include performing parameter verification.

c. Items shipped to or from off-base support shall be reviewed for operation, damage, documentation, and compliance with TO 33K-2-11.

9.4 STANDARD REVIEW. The SR is a complete review of standards certified by PMEL and used to calibrate other TMDE. The SR alone does not sample enough laboratory standards to assess overall quality. However, it

does reveal product quality defects that may be the result of a faulty laboratory process. These defects point management toward areas that require further investigation using root cause analysis. A minimum of one percent of all in-use working standards shall be selected at the beginning of each month and completed in the month selected. For PMELs with less than 100 working standards, a minimum of one working standard per month shall be selected and completed. The SR includes the following:

a. Safety compliance

b. Full parameter verification

c. Physical condition

d. Documentation

e. Traceability (e.g. standards, reports, technical data, environment, facility, etc.)

9.5 SAMPLING RATES. PMEL managers shall ensure the QR and SR sampling rates each month. Consider adjusting rates when negative or positive trends in production quality are observed, when changes occur in the overall skill level of the workforce, or when there are changes in the nature of the TMDE workload.

9.6 PROCESS REVIEW. The PR is a management tool used to target PMEL processes for investigation and improvement. The PR is not intended to be a performance measure and shall not be reported as such. On the contrary, the PR is used to proactively seek out and document procedural problems in order to correct them. PQAs shall observe the selected process as it normally occurs and document any process improvement opportunities before intervening or making comment (except in the case of safety or imminent equipment damage). Initiate PRs as follows:

a. As a step in root cause analysis for every QR and SR critical nonconformity. The PQA shall observe the certifying technician perform the suspect process without divulging the nonconforming condition. The PR may include the entire calibration process, selected steps, or support processes as necessary to determine why the QR nonconformity occurred and if the normal process is sufficient. For example, a PQA discovers a spectrum analyzer to be out of tolerance for flatness; the PQA should observe the technician performing the flatness calibration to determine if the technician's process identifies the nonconformity and/or the process requires improvement. Interaction and discussion between PQA and technician should begin after the suspect task is completed.

b. All K-stamp holders shall participate in at least one PR of a calibration process every 12 months. Management shall ensure these PRs evaluate training and metrology skills appropriate to the technician's position (i.e. a full calibration of an item they typically calibrate).

c. At management's discretion to target any portion of any process. Examination of a process may involve one or more PRs as necessary to collect sufficient data.

9.7 NONCONFORMITY (NC). Accurately classifying NCs is one of the most important steps in the QP. The assigned NC codes are used in trend analysis to determine the most significant problems in the PMEL. By acting on the most significant problems, management improves overall PMEL performance. An item or process may have more than one NC and each NC shall be assigned a NC code. There are four NC classifications:

a. Critical quality NC (QNC). Deficiencies discovered during QRs and SRs that affect safety, accuracy, reliability, or traceability. Root cause analysis must be performed.

b. Non-critical QNC. Minor QR or SR quality defects that may be tracked for trend analysis. PMELs are not required to report non-critical NCs. The category is provided for the convenience of PMEL management.

c. Critical process NC (PNC). Deficiencies discovered during PRs that could affect safety, accuracy, reliability, or traceability. Used only by internal PMEL management to improve PMEL processes.

d. Non-critical PNC. Minor QR or SR process defects that may be tracked for trend analysis. PMELs are not required to report non-critical NCs. The category is provided for the convenience of PMEL management.

9.8 ROOT CAUSE (RC) ANALYSIS. Accurately classifying the RC code of identified NCs is also one of the most important steps in the QP. The assigned RC codes are used in trend analysis to determine the most frequent cause of problems in the PMEL. By eliminating or reducing the most significant cause of problems, management improves overall PMEL performance. RC codes shall be assigned to all critical NCs. RC analysis is simply

applying the Process Improvement Model to the NC and determining the most accurate RC code. Supervisors and PQAs, together with the person performing the process, perform the analysis. For QRs and SRs the NC is found after the fact and your analysis relies on the technical expertise and experience available in your PMEL. For PR NCs, the RC is often directly observed by the PQA. Make every effort to determine the true root cause of the NC and not just a symptom. Avoid simply restating the NC. Usually one "action or inaction" appears to be responsible, but a good RC analysis will address what caused the "action or inaction".

9.9 PROCESS IMPROVEMENT MODEL. The process improvement model is a tool that will help you find the most accurate root cause code and will also help management analyze laboratory trends. The improvement model includes the following steps, each of these steps shall be documented in RC analysis:

a. State the NC.

b. List possible causes for the NC.

c. Select the most probable cause for the NC.

d. Propose corrective action(s) that will eliminate or minimize the root cause of the NC.

e. Select the corrective action most likely to correct the NC.

f. Implement selected corrective action.

g. Follow-up and assess the effectiveness of the corrective action. Return to step b if the corrective action was not effective.

h. Standardize the corrective action within the PMEL. This step may include updating training plans and/or operating procedures to ensure personnel are familiar with new procedures.

9.10 REPORTING REVIEWS. QR, SR, and PR review forms shall be designed to meet the objective of the applicable review. Retain review forms with critical NCs. The results of each review, with or without NCs, shall be recorded in the PAMS QP log or alternate system. The review documentation for critical NCs shall include all steps of the process improvement model and shall specifically state if recall of TMDE was initiated or reasoning for not performing a recall. The PQA shall record the NC and RC codes in PAMS QP Log or alternate system and forward the review form per local procedures. PMEL management shall sign or initial all review forms containing critical NCs and approve/disapprove corrective actions. PMEL management shall document the process for routing of NC review forms. All review worksheets shall identify the ID number, Part Number, and Job Control Number of the applicable TMDE.

9.11 TREND ANALYSIS. Providing accurate data for trend analysis is absolutely critical. All the work done to this point in the QP is wasted unless management is provided the most accurate NC and RC codes. PMEL management shall periodically review the data collected by the QP and track the most frequent QNC, PNC, and RC codes. Non-critical NC codes may also be tracked at the discretion of the manager. Using the Process Improvement Model, management shall act upon the most significant problems and causes in the PMEL. The use of bar charts is recommended. Trend analysis shall be documented and performed at least quarterly.

9.12 QP ACTIVITY SUMMARY. A monthly QP activity summary shall be created and maintained for a minimum of two years or the next AFMETCAL Assessment, whichever is longer. This document is to include the following:

a. QR.

1) Total production subject to QR.

2) Total number of items selected for QR.

3) Total number of QRs completed.

4) Percent of total production selected for QR.

5) QR items with nonconformities (bar code number and nonconformity codes).

b. SR.

1) Total number of in-use laboratory standards.

2) Total number of SRs completed.

3) Percent of total production selected for SR.

4) SR items with nonconformities (bar code number and nonconformity codes).

c. PR. List of PRs completed.

d. List of all bypassed reviews with justification.

e. Total number of "K" stamps issued.

9.13 NONCONFORMITY AND ROOT CAUSE CODES. Codes shall be assigned to each identified nonconformity and its respective root cause. The purpose of assigning codes is to group similar nonconformities and root causes for trending. Standard nonconformity and root cause codes are listed in table 9-1. These specific codes are mandatory and shall not be changed. However, PMEL managers are authorized to expand on QP codes for local use, for example: "A01" The item is unsafe or hazardous to use. "A01A" could represent "Poor electrical power ground" or another category useful to your trend analysis. Recommend using your collected QP data to group your most frequent NCs into subcodes rather than diluting your trend data with a large number of subcodes with one or two NCs in each subcode.

TABLE 9-1

SUMMARY OF QP CODES

NONCONFORMITY CODES:

QNC Codes

A01	The item is unsafe or hazardous to use.
A02	The item is completely inoperative.
A03	The item has a function that is inoperative.
A04	The item does not meet calibration uncertainties for all parameters certified.
A05	The item has a physical deficiency which affects or may affect its operation.
A06	The item is not clean and its condition could affect the item's operation.
A07	The item has a documentation error which affects the item's accuracy or reliability.
A08	The item has an intermittent function which affects the item's accuracy or reliability.
A09	The traceability chain is broken (standards, tech data, traceability report, etc.).

PNC Codes

L01	Current technical order not used, or technical order used contained an error requiring an AFTO Form 22. (affects the item's accuracy or reliability)
L02	Current technical order not used, or technical order used contained an error requiring an AFTO Form 22. (does not affect the item's accuracy or reliability)
L03	Incoming or outgoing inspections were not performed or were performed incorrectly. (affects the item's safety or operation)
L04	Incoming or outgoing inspections were not performed or were performed incorrectly. (does not affect the item's safety or operation)
L05	A full calibration could not be performed.
L06	An overdue standard was used or a standard was incorrectly substituted during calibration of the item.
L07	The item was calibrated in an out-of-tolerance environmental condition. (condition could affect accuracy of calibration)
L08	Calibration fixtures, accessories, or tools were not used or were improperly used.
L09	Technician was not task qualified.

Status of Review Codes

N00	No Defect.
N01	Review in process-not completed.

ROOT CAUSE CODES:

Nonconformities attributed to calibration tech data

C01	Wrong or invalid calibration technical data used.
C02	Calibration technical data in error. (wrong specifications, required equipment not accurate enough to perform calibration
C03	Calibration technical data ambiguous. (allows for more than one interpretation)

Nonconformity attributed to environmental conditions exceeding limits

E01	Temperature exceeded limits at time of calibration.
E02	Humidity exceeded limits at time of calibration.

Nonconformities attributed to internal failure of the TMDE reviewed

F01	Component failure caused degradation or hard failure.
F02	Failure related to previous faulty maintenance or repair.
F03	Failure related to thermal heating.

Nonconformities related to human error

H01	Human error: Used when a lack of proficiency is not a contributing factor and a simple oversight or omission on the part of the individual is determined to be the root cause.

Nonconformity attributed to an inadequate or faulty process

I01	Process inadequate or faulty: Used when root cause analysis indicates all other root cause codes are not applicable. Pertains mainly to processes not associated with the calibration process.

Nonconformities attributed to the standards used to perform calibration

S01	Standard was out of tolerance.
S02	Standard was overdue calibration.
S03	Standard was limited for the function or accuracy used.
S04	Standard was intermittently malfunctioning.
S05	Accessories or calibration fixtures were faulty.

Nonconformities attributed to training deficiencies

T01	OJT insufficient (trainer demonstrates task proficiency).
T02	OJT insufficient (trainer does not demonstrate task proficiency).
T03	Incorrect substitution of standards.
T04	Basic technical school deficiencies.
T05	Advanced technical school deficiencies.

Nonconformity attributed to Owner/User of equipment being reviewed

U01	A defined Owner/User responsibility was not accomplished (Owner/User was not properly trained on responsibilities).
U02	A defined Owner/User responsibility was not accomplished (Owner/User was properly trained on responsibilities).
U03	Owner/User did not receive required schedules, listings, or documentation required to fulfill responsibilities.
U04	Unique mission requirements precluded Owner/User from accomplishing required responsibilities.

SECTION 10

AIR FORCE METROLOGY AND CALIBRATION LABORATORIES

10.1. MAJOR COMMAND (MAJCOM) and AGENCY CODES.

Table 10-1
MAJCOM and AGENCY CODES

MAJCOM/AGENCY		CODE
Air Combat Command	(ACC)	1C
Air Education and Training Command	(AETC)	0J
AF Material Command	(AFMC)	1M
AF Reserves Command	(AFRC)	0M
AF Special Operations Command	(AFSOC)	
AF Space Command	(AFSPC)	1S
Air Intelligence Agency	(AIA)	0U
Air Mobility Command	(AMC)	1L
Air National Guard	(ANG)	4Z
Pacific Air Forces	(PACAF)	0R
US Air Force Academy	(USAFA)	0B
US Air Forces in Europe	(USAFE)	0D

10.2. AIR FORCE PRIMARY STANDARDS LABORATORY (AFPSL) . Table 10-2 contains AFPSL basic information. Address is AFPSL, 813 Irving-Wick Dr. W, Ste 4M, Heath OH 43056-6118.

Table 10-2
AFPSL SITE INFORMATION

SITE NUMBER	LAB Location	BASE Code	PMEL Type	MAJ COM	CMD Code	68ºF Rm(D)	JETSC (#)	TFCU (*)	Remarks
A001	AFMETCAL Det 1 Heath, OH	RRTC	AFPSL	AFMC	1M	D			Contract

10.3. PRECISION MEASUREMENT EQUIPMENT LABORATORIES (PMELs). Table 10-3 contains the assigned PMEL NUMBER and basic site information for all Air Force PMELs.

Table 10-3
PMEL SITE INFORMATION

SITE NUMBER	LAB Location	BASE Code	PMEL Type	MAJ COM	CMD Code	68ºF Rm(D)	JETSC (#)	TFCU (*)	Remarks
P001	Altus AFB OK	AGGN	IIB	AETC	0J				MEO
P002	Andersen AFB, Guam	AJJY	IIB	PACAF	0R		#		MIL
P003	Andrews AFB MD	AJXF	IIB	AMC	1L		#		MIL
P004	Arnold AFB TN	ANZW	IIC	AFMC	1M	D			Contract
P005	Aviano AB, Italy	ASHE	IIB	USAFE	0D		#	***	CORE
P006	Barksdale AFB LA	AWUB	IIB	ACC	1C		#		Contract
P007	Beale AFB CA	BAEY	IIB	ACC	1C		#		Contract
P008	Brooks AFB TX	CNBC	III	AFMC	1M				Contract
P009	Cannon AFB NM	CZQZ	IIB	ACC	1C		#		Contract
P010	Cape Canaveral AFS FL	DBEH	IIC	AFSPC	1S	D			Contract
P011	Cavalier AFS ND	EGYN	III	AFSPC	1S				Contract
P012	Charleston AFB SC	DKFX	IIB	AMC	1L		#		CORE
P013	Clear AFS AK	DXEB	III	AFSPC	1S				Contract

P014	Columbus AFB MS	EEPZ	IIB	AETC	0J		#		Contract
P015	Davis Monthan AFB AZ	FBNV	IIB	ACC	1C		#		CORE
P016	Dover AFB DE	FJXT	IIB	AMC	1L				MIL
P017	Duluth IAP MN	FMKM	IIB	ANG	4Z		#	*	CORE
P018	Dyess AFB TX	FNWZ	IIB	ACC	1C		#	*	Contract
P019	Edwards AFB CA	FSPM	IIC	AFMC	1M	D	#	*	CORE
P020	Eglin AFB FL	FTFA	IIC	AFMC	1M	D	#		CORE
P021	Eielson AFB AK	FTQW	IIB	PACAF	0R		#		MIL
P022	Ellsworth AFB SD	FXBM	IIB	ACC	1C		#		Contract
P023	Elmendorf AFB AK	FXSB	IIA	PACAF	0R	D	#	*	MIL
P024	F.E. Warren AFB WY	GHLN	IIB	AFSPC	1S				Contract
P025	Fairchild AFB WA	GJKZ	IIB	AMC	1L		#		Contract
P026	Feltwell RAF UK	MSET	IIA	USAFE	0D	D	#	****	MIL
P027	Forbes Field KS	GUQG	IIB	ANG	4Z		#	*	CORE
P028	Grand Forks AFB ND	JFSD	IIB	AMC	1L		#		Contract
P029	Hickam AFB HI	KNMD	IIB	PACAF	0R		#	**	MIL
P030	Hill AFB UT (OOALC)	SGQM	IIA	AFMC	1M	D	#	***	Contract
P031	Holloman AFB NM	KWRD	IIC	ACC	1C	D	#	*	CORE
P032	Kadena AB JA	LXEZ	IIA	PACAF	0R	D	#		CORE
P033	Keesler AFB MS	MAHG	IIB	AETC	0J				Contract
P034	Kirtland AFB NM	MHMV	IIC	AFMC	1M	D	#	*	MEO
P035	Kunsan AB ROK	MLWR	IIB	PACAF	0R		#	*	CORE
P036	*BLANK*								
P037	Langley AFB VA	MUHJ	IIB	ACC	1C		#	**	CORE
P038	Laughlin AFB TX	MXDP	IIB	AETC	0J		#		CS
P039	Little Rock AFB AR	NKAK	IIB	AETC	0J		#		CORE
P040	Luke AFB AZ	NUEX	IIB	AETC	0J		#		CORE
P041	MacDill AFB FL	NVZR	IIB	AMC	1L		#		Contract
P042	Malmstrom AFB MT	NZAS	IIB	AFSPC	1S		#	*	Contract
P043	Maxwell AFB Gunter Annex AL	JUBJ	IIB	AETC	0J		#		Contract
P044	McChord AFB WA	PQWY	IIB	AMC	1L		#	*	CORE
P045	McConnell AFB KS	PRQE	IIB	AMC	1L		#	*	Contract
P046	McGuire AFB NJ	PTFL	IIB	AMC	1L		#	**	CORE
P047	Minot AFB ND	QJVF	IIB	ACC	1C		#		Contract
P048	Misawa AB JA	QKKA	IIB	PACAF	0R		#	*	CORE
P049	Moody AFB GA	QSEU	IIB	ACC	1C		#	*	Contract
P050	Mt Home AFB ID (w/ 1 FASTCAL)	QYZH	IIB	ACC	1C		#	*	CORE
P051	Nellis AFB NV	RKMF	IIB	ACC	1C		#	*	CORE
P052	New Boston AFS NH	RNGF	III	AFSPC	1S				Contract
P053	Offutt AFB NE	SGBP	IIB	ACC	1C		#		Contract
P054	Osan AB ROK	SMYU	IIB	PACAF	0R		#	*	CORE
P055	Otis ANGB MA	SPBQ	IIC	ANG	4Z	D	#	*	CORE
P056	Patrick AFB FL	SXHT	IIC	AFSPC	1S			***	Contract
P057	Peterson AFB CO	TDKA	IIB	AFSPC	1S		#		Contract
P058	Pope AFB NC	TMKH	IIB	AMC	1L		#		MIL
P059	Ramstein AB GE	TYFR	IIB	USAFE	0D		#	*	CORE

P060	Randolph AFB TX	TYMX	IIB	AETC	0J	D	#		CS
P061	Robins AFB GA (WRALC)	UHJC	IIA	AFMC	1M	D	#	*	Contract
P062	Scott AFB IL	VDYD	IIB	AMC	1L		#	*	MIL
P063	Selfridge ANGB MI	VGLZ	IIB	ANG	4Z		#	*	CORE
P064	Seymour Johnson AFB NC	VKAG	IIB	ACC	1C		#	*	CORE
P065	Shaw AFB SC	VLSB	IIB	ACC	1C		#		CORE
P066	Sheppard AFB TX	VNVP	IIB	AETC	0J		#		Contract
P067	Thule AB GL	WWCX	IIB	AFSPC	1S				Contract
P068	Tinker AFB OK (OCALC)	SHDF	IIA	AFMC	1M	D		*	Contract
P069	Travis AFB CA	XDAT	IIB	AMC	1L		#	**	CORE
P070	Tyndall AFB FL	XLWU	IIB	AETC	0J		#		Contract
P071	USAF Academy CO	XQPZ	IIB	USAFA	0B				CS
P072	USNS Observation Island	n/a	III	ACC	1S			*	Contract
P073	Vance AFB OK	XTLF	IIB	AETC	0J		#		Contract
P074	Vandenberg AFB CA	XUMU	IIC	AFSPC	1S	D			Contract
P075	Whiteman AFB MO	YWHG	IIB	ACC	1C				Contract
P076	W-Patterson AFB OH	ZHTP	IIC	AFMC	1M	D		***	Contract
P077	Yokota AB JA	ZNRE	IIB	PACAF	0R		#	*	CORE

NOTE: "D" - The "D" indicates PMELs authorized a 68°F Dimensional Room.
"#" - The number of "#"s indicates JETSCs owned by the PMEL.
"*" - The number of "*"s indicates TFCUs owned by the PMEL.

Remarks: CS – Civil Servant Operated
MIL – Military Operated
CORE – Core PMEL, Military
MEO – MEO Operated

10.4. AUTHORIZED USER/OWNER TORQUE CALIBRATION AND REPAIR SITES: Table 10-4 contains the assigned Site Number and basic site information for all authorized torque calibration and repair sites.

Table 10-4
TORQUE SITE INFORMATION

Site Number	Site Location	MAJCOM	Organization	Limitation	Remarks
T001					
T002					
T003					
T004					
T005					